Department of Agriculture, C. P.

REPORT

ON THE

NAGPUR EXPERIMENTAL FARM

IN THE

CENTRAL PROVINCES

FOR

THE YEAR 1900-1901.

Ending 31st March 1901.

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No. 3596/7.

FROM

F. G. SLY, ESQ., I. C. S.,

COMMISSIONER OF SETTLEMENTS AND AGRICULTURE,

Central Provinces,

To

THE CHIEF SECRETARY TO THE CHIEF COMMISSIONER,

REVENUE DEPARTMENT,

Central Provinces.

Nagpur, the 9th September 1901.

SIR,

I have the honour to submit the Annual Report for the year 1900-1901 on the Nagpur Experimental Farm.

2. The monsoon set in late and was at first light, but this deficiency was made up by unusually heavy rain in August and September. It withdrew extraordinarily early and October was a rainless month. The season was on the whole a favourable one for kharif crops. Arhar (tur), which is the latest of the kharif crops, was the only one of which the yield was poor, whilst cotton gave phenomenal yields, the largest ever attained on the Farm. Juar also promised a bumper outturn, but as it did not receive the usual October showers, these prospects were somewhat marred, although the yield was up to the average.

3. On the other hand, the season was a poor one for rainless October, the seed was put down under somewhat unfavourable conditions and these were intensified by the absence of all rain in November and December, which months were unusually hot and marked by an absence of all dew. Then followed exceptional weather in the last three months of the year, constant showers being received. The standing crops were too advanced to benefit from these showers, and the grain in the ear was damaged by discoloration. The yields of rabi crops were so small, no matter under what conditions they were grown, that no conclusions can safely be drawn from the year's experiments, and this is the more to be regretted because the results of the last five years' experiments in rabi crops have been vitiated by the unusual seasons.

4. The principal experiments upon the Farm are concerned with the trial of manures with and without rotation of crops and with and without irrigation. I have already said that the yield of rabi crops was so poor as to vitiate the experiments, but taking the results as they stand, cattle-dung did best as a manure for wheat both with and without irrigation. The use of cattle-dung, however, increases the cost of cultivation because it induces weeds and encourages the depredations of white-ants. Taking the results over the whole series of years, the general conclusion is that for wheat grown on the Farm soil, saltpetre is the best manure and that the most profitable application of it is about 80 lbs. per acre as a top-dressing. The effect is naturally greater in conjunction with irrigation, but it can profitably be used for unirrigated wheat. Two intelligent cultivators near Nagpur were induced to manure their wheat with saltpetre, which was obtained for them by the Farm, and the success of their trial encourages the hope that this result of the Farm experiments may lead to some practical good. One remarkable result of the manure experiments is that bone-dust has entirely failed as a manure for all crops, and indeed in some crops the outturns are less than in unmanured plots. The results of ploughing in a green crop are

somewhat unequal, but over a series of years it is profitable. The growing of a hemp crop during the rains does not interfere with the preparation of the land for the succeeding rabi crop, for the hemp kills all other weeds. In wet years the yield is largely increased, but in dry years the increase is small unless the rabi crop is irrigated. No definite conclusion can as yet be drawn from the experiments with phosphatic manures on oil-seeds.

5. Manuring with fresh sewage on the Meagher system has continued to give excellent results. It would seem that the effect of manuring on this system lasts for five years in level fields and for four years in fields which are scoured. The yields have been extraordinarily heavy, and the method is so simple that it can without difficulty be used by Municipalities for the profitable utilization of night-soil. Mr. Joshi has now drafted a Bulletin which will shortly be published, containing a description of the method and of the results attained by it, and it is hoped that this will induce some Municipal Committees to give the system a trial.

6. The rotation experiments have not as yet given much result, but so far as they go, the results support the common agricultural opinion, which is put into practice, that wheat is benefited by a rotation with a leguminous crop. Wheat followed by a resting fallow is not so profitable as wheat followed by a leguminous crop.

7. In the experiments with mixtures of crops, the result with wheat and gram does not so far support the common agricultural practice of the northern districts that in poor soils a mixture of wheat-gram is a better crop than wheat alone. Mr. Joshi inclines to the opinion that gram takes away more than its share of the moisture leaving too little for the wheat. It may be that in the northern districts the soil is more retentive of moisture, but again the result of the experiment does not agree with the practice in those districts of sowing this mixture in high-lying sloping fields. Amongst kharif crops, cotton with juar seems to be a better mixture than cotton-tur or cotton alone.

8. The experiments under tillage are all confined to testing the effect of deep ploughing upon unirrigated wheat. In the old plot, the year's results confirm those of previous years that ploughing and bakharing in alternate years is the best method of cultivation, but in the new plot in the case of the method of cultivation the experiment in the new duplicate plot this was not the case; in this latter plot the results must be continued for a few more years before reliable results can be expected. A new experiment has been started which includes tillage with the country plough as compared with the Swedish plough, and this should give some interesting information after a few years.

9. Some interesting experiments have been made with new varieties of crops. The most important of these are connected with varieties of cotton. The "Upland Georgian" maintained its reputation as a good variety, and the Farm is in a position to distribute a considerable quantity of seed, which I propose to do next year. I am also getting a supply of new seed from America which will help to show whether the acclimatized variety has deteriorated. Much criticism is heard from the mill-owners about the poor staple of indigenous cottons, but it seems to me that unless they are willing to heartily co-operate, any efforts at improvement must fail. Some "Upland Georgian" seed was given to a cultivator who grew a crop of good staple cotton, but he was unable to obtain from the mills in Nagpur a better price than that given for the ordinary local cotton. His effort was thus discouraged. The best varieties do not yield so heavily as the short staple indigenous cotton, and unless the mills will give a better price for the better material, the cultivator cannot be expected to grow it. Considerable success has been attained with the Egyptian varieties grown as a rabi crop, and the knowledge acquired of its method of cultivation has been sufficient to justify the issue of a Bulletin on the subject in the hope that its cultivation may be taken up by some cultivators. The Farm is able to supply good acclimatized seed.

10. The Farm has also been successful in selecting and acclimatizing good varieties of maize (the Jaunpur) and bajri (the awned variety). Sufficient seed

has been obtained to admit of its distribution to selected districts, and this will be done next year. The varieties of sorghum (amber and collier) have both succeeded and are well worth cultivation by those who require an early and heavy fodder crop. They are particularly valuable for ensilage. The Australian fodder grass, *paspalum dilatatum*, was also successfully grown on the Farm, but a portion sown in the fodder reserve on the stony ridge of Telenkheri did not prosper although it germinated well. It has thus as yet failed to show any drought-resisting quality, but seems to be a useful fodder grass.

11. A new departure and a most successful one was made with the preparation of ensilage, one silo being made in a pit below ground and one by stacking the material above ground. Both produced excellent silage, and there seems no reason why the practice of stacking above ground should not be followed by cultivators with the stalks of juar and maize. A few malguzars who visited the Farm were much impressed with the success of the experiment and announced their intention of trying the method.

12. The Farm has for years past endeavoured to make some investigations concerning rust in wheat. These experiments have mainly been connected with—

(1) the cultivation of Central Provinces varieties of wheat with the object of testing their local reputation for rust-resisting qualities;

(2) the cultivation of Australian varieties reported to be rust-proof;

(3) the breeding of cross-bred wheats with the object of securing a rust-proof variety;

(4) the sowing of wheat seed, two years old, with the object of testing the statement which has been advanced in Australia that wheat grown from old seed does not yield to the attacks of rust.

For some years past the seasons have not been favourable for rust, and consequently few definite results have yet been attained. Again this year there was no rust amongst unirrigated wheats. The new varieties received from Australia, which were irrigated, were severely attacked by rust, and this corroborates the previous experience that the results attained in that country cannot be immediately expected in India. But this does not show that the Australian varieties should altogether be neglected, and efforts will be made by cultivation, acclimatization to develop the rust-resistant qualities in future years and by acclimatization displayed by these varieties in their own home. Some success has been attained in breeding by cross-fertilization a hybridized wheat. Several new varieties have been raised from a cross between the local varieties of good quality and those of poor quality with a reputation for rust resistence. One of these hybrids, a cross between *haura* and *mundia-pissi*, gives some hope of ultimate success. It is a good variety giving excellent yields of plump grain of a good milling quality, and it has all the characteristics of a rust-resistent variety, although this has not been tested in a rust year. The collection of a quantity of seed of a new variety is necessarily a slow matter, but a sufficient supply has now been raised to admit of its distribution. Arrangements have now been made for its trial in several districts.

13. The treatment of juar seed with a solution of sulphate of copper continues to be a complete preventive of "smut." The distribution of the pamphlet explaining the method is reported to have had some success, particularly in the Nagpur District where the Superintendent of Land Records is a passed student of the Poona Science College. Since the close of the year the Farm has distributed selected juar seed to the amount of 400 maunds in the districts of Nagpur, Wardha, Chanda, Bilaspur, Raipur and Hoshangabad, and in the Feudatory States of Nandgaon and Khairagarh.

14. The utility of the Farm must largely be judged by the extent to which the results there attained are made use of by the agricultural community of the Provinces. In the foregoing paragraphs I have given some instances where the

Farm experiments have led to some outside result, such as using saltpetre as a wheat manure, sowing American cotton, the prevention of juar smut and the distribution of seed. It is difficult for the Farm to keep in touch with practical agriculturists, but Mr. Joshi makes every effort to induce them to visit the Farm and to see the experiments in the field. There is undoubtedly much room for practical work in the selection and distribution of seed, and it is hoped to expand this branch of the work. The experiment with wheat shows that the selection of seed largely increases the yield, and demands are often made for good wheat seed. The Farm has not been able in the past to deal with any quantity of seed owing to the absence of storage room, and a much needed improvement is the provision of store-rooms with seed bins.

15. The Sewage Farm has continued to be successfully managed, and it is satisfactory to find that for the first time it has shown a profit, the rents and water rates paid by the Kachi cultivators having more than covered the expenditure.

16. The Agricultural School has done a fairly successful year's work. The senior class was a fairly large one, but the junior class did not fill so well. The raising of the educational standard has had some effect upon admissions, but it brings a much better class of student and the school should turn out men who will be most useful Government servants in the Land Record, Settlement and Court of Wards Departments. The Honourable the Chief Commissioner has now sanctioned the construction on a site adjoining the Farm of a hostel for the students, which will not only add to their comfort but will materially improve the efficiency of the school.

17. This is the first year in which the Telinkheri Farm has been under the management of Mr. Joshi. Much of it was placed under cultivation, and the receipts almost equalled the expenditure. The land is in a dirty condition overrun with *kans* and other weeds, and much has been done to improve it. It will be some years before the soil is suitable for experimental cultivation, but it will be a most useful adjunct in the raising of selected seed for distribution. One experiment has been started to test the different methods of rice cultivation.

18. Mr. Joshi has continued to render excellent service with marked enthusiasm and ability, and the acquisition of the Telink[illegible] has been [illegible]comed by him as an additional field for his energies. [illegible]heri Farm [illegible]we[illegible] wei[illegible]ons[illegible] debt for his many years [illegible]od w[illegible] The Provinces [illegible] him a c[illegible]iderable [illegible] of go[illegible]rk in the efforts to improve agriculture.

I have the honour to be,

Sir,

Your most obedient Servant,

F. G. SLY,

Commissioner of Settlements and Agriculture,

Central Provinces.

No. 89.

FROM

MR. R. S. JOSHI,

SUPERINTENDENT, GOVERNMENT EXPERIMENTAL FARM,

Nagpur,

TO

THE COMMISSIONER OF SETTLEMENTS AND AGRICULTURE,

Central Provinces.

SUBJECT:

Report on the Nagpur and Telinkheri Experimental Farms for the year 1900-1901.

Nagpur, the 9th August 1901.

SIR,

I have the honour to submit the Annual Report on the working of the Experimental Farms at Nagpur and Telinkheri for the year ending the 31st March 1901.

I.—HISTORY OF THE NAGPUR FARM.

History.

2. The Nagpur Experimental Farm was established in 1883, in which year the former Model Farm was given up and the present site selected in its stead. The land is close to Nagpur and is moderately typical of the black cotton soil which is to be found in the Central Provinces. It consists of a fairly level piece of land of about 90 acres in extent, out of which about 70 acres are under cultivation, the rest being occupied by roads, buildings and waste land. The soil is of the black cotton type, but of somewhat inferior quality. It varies in depth from 4 to 10 feet and is situated upon gneiss rock. The natural drainage is, however, bad and kharif crops frequently suffer in consequence. The road to Ambajheri which intersects the Farm acts as an embankment which holds up the water. New drains were opened in 1896, but they have not improved the drainage of the Farm as much as could be desired.

II.—CHARACTER OF THE SEASON.

3. [illegible] compares the rainfall of the year as registered on the Farm with the average of the preceding twenty-six years :—

Season. 1900-1901.

Rainfall.

Month.	No. of rainy days.	Rainfall.	Average of 26 years preceding.	Month.	No. of rainy days.	Rainfall.	Average of 26 years preceding.
		Inches.	Inches.			Inches.	Inches.
				Brought forward ...	53	46·66	43·51
April ... 1st half ...	...	...	·14	October. 1st half ...	...	...	1·27
2nd half ...	...	·12	·28	2nd half ...	...	...	1·33
May ... 1st half ...	...	...	·23	Novem- 1st half ...	...	...	·69
2nd half ...	1	·14	·26	ber. 2nd half ...	...	...	·18
June ... 1st half ...	2	·33	2·87	Decem- 1st half ...	...	...	·11
2nd half ...	4	2·74	5·15	ber. 2nd half ...	...	...	·28
July ... 1st half ..	10	7·61	6·80	January. 1st half ...	4	1·13	·34
2nd half	6	7·84	7·59	2nd half ...	...	...	·21
August. 1st half ...	8	15·55	6·40	February 1st half ...	1	·16	·20
2nd half ..	6	1·34	5·13	2nd half ...	4	1·13	·24
Septem- 1st half ..	7	2·67	4·68	March ... 1st half ...	3	·61	·21
ber. 2nd half ...	9	8·32	3·98	2nd half ..	1	·44	·15
Total carried over ...	53	46·66	43·51	GRAND TOTAL ...	66	50·13	48·72

NOTE.—A rainy day is taken as one on which there was a fall of not less than 10 cents.

4. The regular monsoon set in during the latter half of June and the sowings of cotton and tur were timely. The rainfall of the first half of August was unusually heavy, while that during the second half of the same month and the first half of September was very light.

Heavy rain fell during the second half of September. The remaining three months were rainless. Light showers fell during January, February and March. The rainfall of the whole year amounted to 50·13 inches against an average of 48·72 inches.

5. The season was very favourable to cotton which gave an abnormal yield. The juar crop thrived very well, and though it was in need of some rain in October, the plants assisted by the heavy rainfall of September, matured exceedingly well. The green undeveloped pods of tur were very much damaged by caterpillars during November and December, which reduced the outturn of the crop.

The rabi crops were sown in time, but they did not thrive as the moisture in the ground began to descend rapidly. The damage caused by the absence of rain during October, November and December was increased by the absence of all dew. The rain which fell in the 1st half of January amounted to 1·13 inches, but the crops were too far advanced to derive any benefit therefrom. The rainfall of February did more harm than good. It drenched all the grain on the threshing floor as well as the unreaped crops in the fields. The consequence was that the grain was discoloured and nearly 25 per cent. was spoiled in the year.

III.—EXPERIMENTS WITH MANURES.

Manure.

6. The different manures experimented with on the Farm fall into two classes, *viz.*, natural and chemical.

The natural manures are:—

(1) Box-dung.
(2) Stall-dung.
(3) Saltpetre.
(4) Bone-dust.
(5) San-hemp (*Crotolaria juncea*) ploughed in green.
(6) Kadoojira (*Vernonia cineria.*)
(7) Ashes of cattle-dung.

The chemical manures are:—

(1) Ammonium chloride.
(2) Calcium superphosphate.
(3) Potassium sulphate.
(4) Calcium sulphate.

No description of the chemical manures is necessary. That of the natural manures is given below:—

(1) *Box-dung.*—Box-dung is prepared at the Farm in the following manner:—

A pit measuring 10′ × 10′ and 2′ 6″ deep is dug in t[illegible] cklined ur sides. A pair of bullocks [illegible]ed in the pit, whi[illegible]e cattle-shed and is br[illegible]d in on fo[illegible]attle-shed. The exc[illegible] are t[illegible]h liquid [illegible]e the other bullocks are stalle[illegible]nd the c[illegible] straw that [illegible]rements (bot[illegible] the [illegible]and solid) of the former fall in the pit, a[illegible] the litt[illegible] is left uneaten in [illegible] manger is spread over the excrements in the morning when the bullocks are let out either for work or for grazing. It takes generally from five to six months for the pit to be filled up to the top. The manure is then carted away and deposited in an ordinary pit dug in the ground for storing manure. These pits are covered over with straw to check evaporation, and are watered occasionally in the hot weather between March and June. The manure is not used until the lapse of one year from the date of deposit.

As this manure contains about one half litter, the amount (*viz.*, 240 maunds) which is applied to an acre of land, is larger than the 160 maunds of stall-dung manure which would be put into an acre, since the stall-dung manure contains no litter.

(2) *Stall-dung.*—The term stall-dung is applied to dung collected from the cattle-shed from day to day and stored in an ordinary pit. This manure is also covered over with straw and watered at intervals in the hot weather. It contains no urine but only the solid excrements of the bullocks without straw.

(3) *Saltpetre.*—The saltpetre that is used on the Farm is crude saltpetre, obtained from Cawnpore through the Director of Land Records and Agriculture, North-Western Provinces and Oudh. It is of two descriptions, black and white, the latter being a purer variety. The amount of saltpetre applied in the Farm is 240 lbs. to the acre, and it is, as a rule, drilled in with the seed. A sample similar to that used in the year under report was analysed by Doctor Leather in the year 1895-96. The results of that analysis were given in the Farm Report of that year.

(4) *Bone-dust.*—This manure is prepared in the following manner:—Bones of animals are ground in a mill, such as is usually used for grinding lime (chunam). They are then passed through a sieve, and the fine powder resulting is applied at the rate of 360 lbs. to the acre, the method of application being the same as in the case of saltpetre.

(5) *San-hemp* (*Crotolaria juncea*) *ploughed in green.*—The seed of the hemp is sown broadcast at the beginning of the rains at the rate of 100 lbs. per acre. On the 15th of August as the plants approach maturity, they are uprooted by hand and are buried in the furrows made by the Swedish plough. The plant san-hemp is one of the order *Leguminosæ*, sub-division *Papolionacæ*, which possesses the property of storing nitrogen from the atmosphere by the aid of nodules at their roots.

(6) *Kadoojira* (*Vernonia cineria*).—This weed grows in abundance on the waste lands of the Farm. It is collected from these waste lands and is ploughed in by the same method as has been described above in the case of san-hemp.

(7) *Ashes of Cattle Dung.*—Cattle-dung is collected and made into cakes, which when dry, are burnt and reduced to ashes; 3,080 lbs. are applied per acre.

Experiments with different manures.

7. Twelve experiments were carried on to test the comparative value of different manures or different methods of manuring. Perhaps the most important are those which are conducted on the two series of plots called A and B, in which wheat is annually manured with different materials, the only difference in the treatment being that the A series is irrigated, whilst the B series does not receive artificial irrigation. Series A was started seventeen years ago, series B eleven years ago.

In fields Nos. 18 and 32 the effect of manuring wheat with a green crop ploughed into the land in August is compared with the outturn of land manured with cattle dung. The effect also on the wheat crop of saltpetre is tested in fields Nos. 68 and 23, the former of which is irrigated. In fields Nos. 15 and 55 wheat is manured with cattle dung, which is put on the land at different periods, two plots being manured in June and the other in August.

A series of plots are manured on the system devised by Mr. G. Ville, and the crop was wheat. Lastly, in fields Nos. 9 and 59 an experiment to test the effect of phosphatic manures on different oilseeds such as safflower (*Carthamus tinctoreus*), til (*sesamum*), linseed and mustard is tried. This is an experiment suggested by Dr. Leather, *vide* paragraph 3 of Annexure E to the Report for 1895-96. All the available fields had in previous years been manured on the system initiated by Lieutenant Meagher, and this year they were sown with juar.

8. The results obtained in the case of each of these experiments during the year under report are tabulated in the following statements, together with those of previous years, and such remarks as are deemed necessary are added in each case :—

SERIES A. SUBJECT.—*Effect on wheat grown continuously on different kinds of manures applied year after year with irrigation.*

Plot I.—Area ·10 acre. Manured with saltpetre 240 lbs. per acre.
„ II. „ ·10 „ „ „ bone-dust 360 lbs. per acre.
„ III. „ ·10 „ „ „ saltpetre 240 lbs. and bone-dust 360 lbs. per acre.
„ IV. „ ·10 „ „ „ cattle dung 160 maunds per acre.
„ V. „ ·10 „ „ „ cattle dung 160 maunds and bone-dust 360 lbs. per acre.
„ VI. „ ·10 „ „ „ ashes of 160 maunds cattle-dung per acre.
„ VII. „ ·10 „ Unmanured.
„ VIII. „ ·10 „ Green manured with san-hemp.

Commenced in 1890-91. Irrigated once in December (20th to 23rd). Crop—Wheat (*haura*—Nagpur).

Number of plot.	OUTTURN PER ACRE.															Cost of cultivation per acre.	Cost of manuring per acre	COST OF IRRIGATION.		Gain in value on Plot No. VII.
	AVERAGE OF PRECEDING 5 YEARS (1890-91 to 1894-95).		1895-96.		1896-97.		1897-98.		1898-99.		1899-1900.		1900-1901.					Labour.	Assumed water-rate per acre of watering.	
	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Value.					
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.			lbs.	lbs.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
I	931	1,789	1,188	1,537	796	804	746	964	741	1,069	Wheat not sown owing to lack of moisture in the soil.		657	832	37 8 8	18 2 0	16 3 2	0 15 0	2 0 0	15 1 7
II	626	954	765	835	391	469	551	869	459	461			504	826	29 7 8	19 13 6	3 7 8	0 15 0	2 0 0	7 0 7
III	1,012	1,924	1,145	2,005	806	854	714	1,066	746	754			471	709	27 5 2	18 2 0	19 9 2	0 15 0	2 0 0	4 14 1
IV	717	1,217	1,050	1,320	734	806	772	1,267	1,011	1,189			807	1,392	47 7 6	18 2 0	13 6 2	0 15 0	2 0 0	25 0 5
V	739	1,343	1,254	1,706	778	792	761	1,039	987	1,003			446	2,244	31 10 0	20 14 2	16 13 10	0 15 0	2 0 0	9 2 11
VI	584	915	754	1,074	560	600	656	664	546	554			572	807	33 5 0	18 14 6	11 0 8	0 15 0	2 0 0	10 13 11
VII	486	820	517	702	316	344	355	405	282	318			386	594	22 7 1	18 14 6	...	0 15 0	2 0 0	...
VIII	564	1,090	580	730	424	516	655	785	424	996			706	1,076	41 12 4	15 3 4	8 2 0	0 15 0	2 0 0	19 5 3

NOTE.—The figures of average outturn from 1890-91 to 1896-97 are transferred from the B. Series.

The wheat was sown on the 19th of October and reaped on the 6th of March. Plot No. IV manured with cattle dung stands first. Plot No. VIII which was green manured with hemp shows very good results. Owing to the drought the plot was not cropped last year, so that the manure applied in that year remained over for utilization along with that applied during the year under report. The plot manured with saltpetre stands third in the order of yield. Plot VI manured with ashes stands fourth and plot No. II manured with bone-dust only stands fifth. The remaining plots, *viz.*, Nos. III and V where there is a mixture of bone-dust with saltpetre and cow-dung respectively have shown very poor results, and their yields are even less than plot No. II which was manured with bone-dust only.

SERIES B. SUBJECT.—*Effect on wheat grown continuously of different kinds of manures applied year after year without irrigation.*

Plot I.—Area ·10 acre. Manured with saltpetre 240 lbs. per acre.
„ II. „ ·10 „ „ „ bone-dust 360 lbs. per acre.
„ III. „ ·10 „ „ „ saltpetre 240 lbs. and bone-dust 360 lbs. per acre.
„ IV. „ ·10 „ „ „ cattle dung 160 maunds per acre.
„ V. „ ·10 „ „ „ cattle dung 160 maunds and bone-dust 360 lbs. per acre.
„ VI. „ ·10 „ „ „ ashes of 160 maunds cattle-dung per acre.
„ VII. „ ·10 „ Unmanured.
„ VIII. „ ·10 „ Green manured with san-hemp.

Commenced in 1884-85. Unirrigated. Crop—Wheat (*haura*—Nagpur).

Number of plot.	OUTTURN PER ACRE.																Cost of cultivation per acre.	Cost of manuring per acre.	Gain in value on plot No. VII.
	Average of five years, 1885—89.		Average of preceding five years (1890—94).		1895-96.		1896-97.		1897-98.		1898-99.		1899-1900.		1900-1901.				
	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Value.			
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.			lbs.	lbs.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
I	1,133	1,711	751	1,468	836	1,006	456	554	491	809	456	594	Wheat not sown owing to lack of moisture in the soil.		410	700	24 1 5	16 12 4	16 3 2	10 9 11
II	831	1,388	534	882	486	654	241	359	394	826	282	417			346	634	20 7 10	16 12 4	3 7 8	7 0 4
III	1,094	1,751	865	1,538	621	709	472	647	485	1,045	362	487			369	621	21 10 5	16 12 4	19 9 2	8 2 11
IV	913	1,520	627	1,393	532	678	286	464	286	604	279	521			440	910	26 6 11	22 15 6	13 6 2	12 15 5
V	953	1,415	666	1,224	632	729	374	576	502	1,147	625	1,025			562	807	32 7 4	21 10 8	16 13 10	18 15 10
VI	949	1,598	576	1,125	621	691	231	339	302	837	311	489			329	631	19 9 4	21 4 0	11 0 8	6 1 10
VII	799	1,297	418	796	209	316	167	462	279	521	107	212			224	466	13 7 6	20 2 6	...	...
VIII	705	1,137	584	1,115	236	311	65	255	294	556	252	447			421	859	25 4 0	18 9 6	8 2 0	11 12 6

This series is the duplicate of the A Series but receives no irrigation. A comparison of the results of the plots of this series with those of A, should show how far irrigation alone helps to increase the yield of the plots. The crop this season was so affected by the character of the season that the small yields give no definite information.

FIELD NO. 18. SUBJECT.—*Relative effect of green manuring, box-dung and stall-dung on wheat grown continuously.*

Plot I.—Area ·25 acre. Green manured with kadoojira (*Vernonia cineria*).
„ II. „ ·25 „ Unmanured.
„ III. „ ·25 „ Manured with box-dung at 240 maunds per acre.
„ IV. „ ·25 „ Manured with stall-dung at 160 maunds per acre.

Commenced in 1890-91. Unirrigated. Crop—Wheat (*haura*—Nagpur).

Number of plot.	OUTTURN PER ACRE.																		
	Average of preceding five years (1890-91 to 1894-95).		1895-96.		1896-97.		1897-98.		1898-99.		1899-1900.		1900-1901.						
	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Value.	Cost of cultivation.	Cost of manure.	Gain in value on plot No. II.
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
I	594	878	276	433	32	75	83	196	201	429	¼	6	474	837	27 15 2	17 2 0	6 0 8	8 15 10
II	473	727	462	640	63	121	225	519	213	311	¼	7	327	489	18 15 4	18 6 8	...	...
III	657	1,179	755	1,036	185	375	348	760	613	890	⅛	13	726	1,250	42 11 1	17 11 4	12 7 4	23 11 9
IV	624	878	798	1,161	202	441	489	918	740	1,040	½	21	800	1,379	47 0 9	18 3 0	14 6 4	28 1 5

The results are in accord with those of the previous years and plots Nos. III and IV, which were manured with box-dung and stall-dung respectively, still hold their position. The green manured plot has not shown bad results.

FIELD NO. 32. SUBJECT.—*Effect on wheat of green manuring with cut composita weed, kadoojira (Vernonia cineria), collected from waste land on the Farm.*

Plot I.—Area ·16 acre. Green manured with kadoojira in year under report.

„ II. „ ·16 „ Unmanured.

Commenced in 1891-92. Unirrigated. Crop—Wheat (*haura*—Nagpur).

No. of plot.	OUTTURN PER ACRE.															
	AVERAGE OF PRECEDING FIVE YEARS, 1891-92 to 1895-96.		1896-97.		1897-98.		1898-99.		1899-1900.		1900-1901.					
	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Value.	Cost of cultivation.	Cost of manuring.	Gain in value on plot No. II.
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.			lbs.	lbs.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
I	759	1,345	329	452	562	1,187	509	648	Wheat not sown owing to lack of moisture in the soil.		762	1,150	44 3 5	18 13 7	4 7 4	13 0 2
II	551	1,000	333	535	498	1,027	412	662			540	779	31 3 3	19 8 6	...	...

The green-manured plot being lowlying continued to show good results and has gained in value on plot No. II by Rs. 13-0-2. By deducting the cost of manuring which is Rs. 4-7-4, the net profit gained is Rs. 8-8-10. This experiment is an exact duplicate of that carried out in plots I and II of field No. 18, but in this experiment the land is lowlying with more moisture and the use in it of green manuring is more profitable.

FIELDS NOS. 23 AND 68. SUBJECT.—*Effect on wheat of manuring with saltpetre at different rates per acre with and without irrigation.*

FIELD NO. 23.—*Unirrigated.*

Plot I.—Area ·30 acre. Unmanured.

„ II. „ ·30 „ Manured with 240 lbs. of saltpetre per acre (80 lbs. drilled with the seed and 160 lbs. top dressed).

„ III. „ ·30 „ Manured with 80 lbs. of saltpetre per acre as top dressing.

FIELD NO. 68.—*Irrigated.*

Plot I.—Area ·10 acre. Unmanured.

„ II „ ·10 „ Manured with 240 lbs. of saltpetre per acre (80 lbs. drilled with the seed and 160 lbs. top-dressing).

„ III „ ·10 „ Manured with 80 lbs. of saltpetre per acre as top-dressing.

Commenced in 1897-98. Crop—Wheat (*haura*—Nagpur).

OUTTURN PER ACRE OF FIELD NO. 23.											OUTTURN PER ACRE OF FIELD NO. 68.									
	1897-98.		1898-99.		1899-1900.		1900-1901.					1897-98.		1898-99.		1899-1900.		1900-1901.			
No. of plot.	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Value.	Gain on plot No. I.	No. of plot.	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Value.	Gain on plot No. I.
	lbs.	lbs.	lbs.	lbs.			lbs.	lbs.	Rs. a. p.	Rs. a. p.		lbs.	lbs.	lbs.	lbs.			lbs.	lbs.	Rs. a. p.	Rs. a. p.
I	345	678	244	426	Wheat not sown owing to lack of moisture in the soil.		342	592	20 1 11	.....	I	620	910	377	422	Wheat not sown owing to lack of moisture in the soil.		450	770	26 7 1	...
II	372	672	282	465			322	502	18 11 10	—1 6 1	II	999	1,231	1,059	1,091			730	1,380	43 6 0	+16 14 11
III	413	767	290	527			365	541	21 2 3	+1 0 4	III	1,075	1,305	1,202	1,247			920	1,530	53 14 4	+27 7 3

NOTE.—Field No. 68 was irrigated once on December (25th and 26th) Field No. 23 was not irrigated.

The application this year of a top-dressing only of a small quantity of saltpetre has produced better results in plot No. III of both the fields (irrigated and unirrigated) than plot No. II which was given treble the quantity of saltpetre. Plot No. II of field No. 23 has shown very poor results. I observed that in the high lying portion of this plot the plants arrived at maturity much earlier than in the lowlying portion. The consequence was that the plants bore very small ears. I have noticed that in the absence of cold weather rain wheat matures earlier than usual and consequently gives poor yields. The value of irrigation is most marked.

FIELDS NOS. 15 AND 55. SUBJECT.—*Effect of manuring wheat at different times of the year*, i. e., *June and August.*

FIELD No. 15.	FIELD No. 55.
Plot I.—Area ·23 acre. Manured with 160 maunds dung in June.	Plot I.—Area ·27 acre. Manured with 160 maunds dung in June.
„ II. „ ·23 „ Manured with 160 maunds dung in August.	„ II. „ ·27 „ Manured with 160 maunds dung in August.
[Lowlying] Morand doyam.	[High-lying] Morand Awal.

Commenced in 1897-98. Unirrigated. Crop—Wheat (*haura*—Nagpur).

OUTTURN PER ACRE OF FIELD No. 15.										OUTTURN PER ACRE OF FIELD No. 55.									
No. of plot.	1897-98.		1898-99.		1899-1900.		1900-1901.			No. of plot.	1897-98.		1898-99.		1899-1900.		1900-1901.		
	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Value.		Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Value.
	lbs.	lbs.	lbs.	lbs.			lbs.	lbs.	Rs. a. p.		lbs.	lbs.	lbs.	lbs.			lbs.	lbs.	Rs. a. p.
I	220	498	222	483	Wheat not sown owing to lack of moisture in the soil.		278	478	16 5 6	I	258	519	276	520	Wheat not sown owing to lack of moisture in the soil.		358	687	21 5 0
II	166	312	206	398			322	521	18 12 10	II	181	389	209	402			366	660	21 10 1

Plots No. I of both fields were manured on June 3rd and plots No. II of the same fields were manured on the 20th August. In field No. 15 the yield of the plot manured in August has increased by 44 lbs., while in field No. 55 the increase in yield is only 8 lbs. No definite result has yet been attained in this experiment.

VILLE SERIES. SUBJECT.—*Practical method of soil analysis by using chemical manures as devised by Mr. George Ville.*

Plot I.—Area ·05 acre. Manured with Ammonic chloride 140 lbs. per acre.
„ „ Calcic superphosphate 180 lbs. per acre.
„ „ Potassic sulphate 90 lbs. per acre.
„ „ Calcic sulphate 100 lbs. per acre.
„ II. „ ·05 „ „ as above, less Calcic superphosphate.
„ III. „ ·05 „ „ as in plot No. I less Ammonic chloride.
„ IV. „ ·05 „ No manure.
„ V. „ ·05 „ Manured as in plot No. I less Potassic sulphate.
„ VI. „ ·05 „ „ „ „ Calcic sulphate.

Commenced in 1900-1901. Unirrigated. Crop—Wheat (*hybridized mundia pissi-haura*—Nagpur).

No. of plot.	OUTTURN PER ACRE.		
	Grain.	Straw.	Value.
	lbs.	lbs.	Rs. a. p.
I	580	940	33 14 3
II	580	1,280	35 2 2
III	480	1,020	28 14 11
IV	560	940	32 13 6
V	580	860	33 9 7
VI	510	790	29 10 8

The Ville Series.—The site of these plots is on a high and fairly level piece of land and the absence of cold-weather rain vitiates the experiment as the manures are not assimilated. The germination was uneven and the crops matured prematurely. Plot No. II, which has received all the manures except calcic superphosphate, has shown the best results, and it is quite in accord with our past experience that the soil on the Farm does not require calcic and phosphatic manure as it contains these in abundance. The soil lacks nitrogen, and this fact is verified by the results of plot No. III, which has received all the manures except ammonium chloride. Plot No. IV, which has received no manure at all, ought to have shown poorer results than plot No. III, which has received all the ingredients except nitrogen. This is the first year of the experiment and no conclusion can be drawn at present.

FIELD NO. 9. SUBJECT.—*Effect of phosphatic manures on different oilseeds.*

Plot I.—Area ·27 acre. Unmanured.
„ II. „ ·27 „ Manured with saltpetre 281·9 lbs. per acre.
„ III. „ ·27 „ „ „ burnt bones 277 lbs. per acre.
„ IV. „ ·27 „ „ „ raw bones 393 lbs. per acre.
„ V. „ ·27 „ „ „ „ 393 lbs. and saltpetre 281·9 lbs. per acre.

Commenced in 1896-97. Unirrigated. Crop—Til and safflower in year under report.

No. of plot.	Area.	Outturn per acre. 1896-97.			1897-98.			1898-99.			1899-1900.			1900-1901.		
		Crop.	Seed.	Stalks.	Crop.	Seed.	Stalks.	Crop.	Seed.	Stalks.	Crop.	Seed.	Stalks.	Crop.	Seed.	Stalks.
	Acres.		lbs.	lbs.		lbs.	lbs.		lbs.	lbs.		lbs.	lbs.		lbs.	lbs.
I-E	·14	Til.	243	714	Mustard	...	...	Saf-flower.	592	1,170	Lin-seed.	...	1	Til.	125	445
II-E	·14	„	362	936	„	30	316	„	724	1,508	„	·48	6	„	250	814
III-E	·14	„	221	671	„	...	...	„	687	1,380	„	·96	11	„	121	528
IV-E	·14	„	218	764	„	...	...	„	437	940	„	...	...	„	79	243
V-E	·14	„	154	664	„	...	...	„	313	710	„	...	...	„	87	343
I-W	·13	Saf-flower.	384	778	Linseed	304	427	Til	16	77	Mus-tard.	...	...	Saf-flower.	521	1,417
II-W	·13	„	359	1,149	„	295	512	„	197	508	„	...	...	„	754	1,628
III-W	·13	„	441	697	„	236	395	„	61	208	„	...	...	„	323	868
IV-W	·13	„	458	750	„	196	373	„	70	238	„	...	...	„	372	882
V-W	·13	„	321	556	„	79	152	„	25	123	„	...	...	„	216	521

FIELD No. 59. SUBJECT.—*Effect of phosphatic manures on different oilseeds.*

Plot I.—Area ·31 acre. Unmanured.
„ II. „ ·31 „ Manured with saltpetre 281·9 lbs per acre.
„ III. „ ·31 „ „ „ burnt bones 277 lbs. per acre.
„ IV. „ ·31 „ „ „ raw bones 393 lbs. per acre.
„ V. „ ·31 „ „ „ „ 393 lbs. and saltpetre 281·9 lbs. per acre.

Commenced in 1896-97. Unirrigated. Crops—Linseed and mustard in year under report.

No. of plot.	Area.	OUTTURN PER ACRE. 1896-97.			1897-98.			1898-99.			1899-1900.			1900-1901.			Remarks.
		Crop.	Seed.	Stalks.	Crop.	Seed.	Stalks.	Crop.	Seed.	Stalks.	Crop.	Seed.	Stalks.	Crop.	Seed.	Stalks.	
	Acres.		lbs.	lbs.		lbs.	lbs.		lbs.	lbs.		lbs.	lbs.		lbs.	lbs.	
I-E ...	·15	Lin-seed.	5	48	Til.	230	920	Lin-seed.	103	276	Til.	59	Stalks not weighed.	Lin-seed.	133	266	
II-E ...	·15	„	1	12	„	382	1,413	„	67	172	„	29		„	262	565	
III-E ...	·15	„	5	49	„	447	1,560	„	121	299	„	57		„	191	369	
IV-E ...	·15	„	6	47	„	353	1,293	„	132	367	„	39		„	135	345	
V-E ...	·15	„	5	48	„	337	1,040	„	117	336	„	9		„	145	315	
I-W ...	·16	Mus-tard.	74	148	Saf-flower.	922	1,897	Mus-tard.	162	361	Saf-flower.	Not sown.		Mus-tard.	215	460	
II-W ...	·16	„	61	111	„	857	2,137	„	175	356	„	„		„	537	581	
III-W ...	·16	„	78	131	„	947	2,253	„	113	257	„	„		„	237	506	
IV-W ...	·16	„	144	281	„	930	2,276	„	62	218	„	„		„	220	473	
V-W ...	·16	„	65	116	„	851	1,924	„	137	342	„	„		„	235	491	

Til was sown in field No. 9 on the 17th August and safflower was sown on the 11th October. The til seed germinated well, but the rainfall of September did the crop more harm than good. The plants were stunted in growth and the yield was poorer than that obtained in the year 1896-97. The results of these plots are all unsatisfactory, and this is due to the inequality of the soil and their low lying position. Plot No. 1 though unmanured gives good results every year with any crop.

The results of field No. 59 are better. The plots are even and are not water-logged like those of field No. 9. Plots Nos. II and III manured with saltpetre and burnt bones have yielded very fair crops of linseed and mustard. Raw bones failed to produce any effect on both the crops. The mixture of raw bones and saltpetre does not show good results. I must however note that the rotation of til and linseed benefits the latter crop. Cultivators are of opinion that linseed cannot be sown in the same field until after the lapse of a period of 4 or 5 years. In field No. 57 linseed is sown in the following rotation—linseed, cotton, linseed, tur, linseed, gram, but the improvement in the yield of linseed has not been so great as in field No. 59, in which til is the only rotation.

Manuring fields on the Meagher system.

9. The experiments referred to in this paragraph have two objects: first, to ascertain how far this system of manuring initiated by Lieutenant Meagher of Allahabad improves the outturns of different crops; secondly, to ascertain for what period of years the effect of manures applied to fields on this system lasts.

In the year under report no field was manured on this system as they had been all manured in previous years and the effect has now simply to be watched. All the fields were sown with juar on the 12th to 14th July and reaped on the 1st to 15th December. The outturn of each is tabulated below:—

No. of field.	Time of manuring after Meagher system.	1896-97.		1897-98.		1898-99.		1899-1900.		1900-1901.	
		Crop.	Outturn per acre.	Crop.	Outturn per acre.	Crop.	Outturn per acre.	Crop.	Outturn per acre.	Crop.	Outturn per acre.
			lbs.		lbs.		lbs.		lbs.		lbs.
52 S	April 1896 ..	Cotton mixed with juar, bajri and ambari.	243 400 250	Til	200	Cotton and paddy.	473 1,600	Juar ...	Failed to come to ears.	Juar ...	951
52	May 1897 ..	...	...	Juar and paddy.	2,180 2,300	Do.	435 1,800	Do. ..	Do. ...	Do. ...	1,040
60	Do. ...	...	...	Cotton (Jari.)	693	Bajri (Nadiad.)	1,526	Do. ...	Do. ...	Do. ...	1,937
				Do. (Bani.)	805	Do. (Malbandro.)	1,651				
				Do. (U. G.)	791	Do. (Bhaonagri.)	1,489				
				Do. (Nimari) new seed.	598	Do. (Awned).	1,503				
				Do. (Nimari) old seed.	764	Do. (Poona select.)	1,641				
				Do. (Tree.)	903	Sorghum (collier.)	1,872				
				Do. (Egyptian.)	46	Do. (amber.)	2,062				
54 56 58	April and May 1898.	...	...	...	...	Juar and paddy.	2,012 1,815	Do. ...	Do. ...	Do. ...	1,629
48 N 48 S 50 N	April 1899 ...	...	...	...	...	...	...	Juar and maize.	Do. ...	Do. ...	1,803
62	April 1899 ...	...	...	...	...	...	...	Juar ...	134	Do. ...	2,456 Grain 10,441 Karbi.
64	Do. ..	...	...	...	...	...	...	Do. ...	Failed to come to ears.	Do. ...	1,708
66 and a part of No. 49.	Unmanured ...	...	...	...	...	...	...	...	...	Do. ...	704 Grain. 2,464 Karbi

The outturns of fields Nos. 50-S and 52 are now nearly normal, and they have been again manured in May 1901 for the current year's cropping. It seems that the effect of the application of the manure does not last more than five years. Field No. 52 having suffered from erosion caused by the floods has lost the effect of the manure within a period of 4 years. The yields have been extraordinarily large and clearly demonstrate the advantage of this system of manuring.

IV.—ROTATION EXPERIMENTS WITHOUT MANURES.

Rotation.

10. These experiments are conducted in three different fields, their objects being to test the practices observed by the cultivators of these provinces and to see whether there is any practical possibility of improving on them. In field No. 29 wheat is followed by gram, juar, &c., or a fallow. In field No. 57 linseed is followed by cotton and other crops. In field No. 61 cotton-tur is followed by wheat and gram. The most important of these experiments are those conducted in fields Nos. 29 and 57. Experiments in these fields were started ten years ago, while the experiment in field No. 61 began in 1893-94. The results which have been obtained in the case of each of these plots are tabulated below and are compared with those of previous years:—

FIELD NO. 29. SUBJECT.—*Effect of rotation with wheat.*

Plot	I.—Area ·13 acre.	Wheat every year.
„	II. „ ·13 „	Wheat and fallow alternately.
„	III. „ ·13 „	Wheat and gram alternately.
„	IV. „ ·13 „	Wheat and juar-tur (mixed) alternately.
„	V. „ ·13 „	Wheat and kodon alternately.

Commenced in 1890-91. Unmanured and unirrigated. For cropping, see column 2 below.

Number of plot.	Crop.	OUTTURN PER ACRE.															
		Average of preceding 5 years 1890-91 to 1894-95.		1895-96.		1896-97.		1897-98.		1898-99.		1899-1900.		1900-1901.			
		Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Value.	Cost of cultivation.
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	Rs. a. p.	Rs. a. p.
I.	Wheat ..	578	960	855	1,031	331	523	400	854	493	676	Wheat not sown.		623	838	35 12 5	16 12 7
II.	Wheat and fallow.	638	1,338	...	...	382	626	...	...	443	649	...	...	484	678	27 14 4	13 7 4
III.	Wheat ...	568	1,225	...	...	441	774	...	...	540	937	...	...	492	808	28 12 7	15 6 1
	Gram ...	444	840	508	840	...	...	500	846	...	...	5	96	...	...	...	...
IV.	Wheat and ...	654	1,320	...	...	283	533	...	...	428	764	...	...	716	1,099	41 9 9	14 4 2
	Juar-Tur ...	164	2,298	579	2,663	...	...	776	1,530	...	...	4	2,131	...	...	...	...
		259	741	566	853	...	...	445	778	...	...	226	1,697	...	...	...	...
V.	Wheat ...	726	1,492	...	...	295	426	...	...	386	730	...	...	511	982	30 6 9	14 4 1
	and Kodon ..	399	638	540	628	...	...	853	1,215	...	...	90	2,031	...	...	...	...

During the year under report wheat was sown in all the plots on the 18th October and reaped on the 10th February. Plot No. IV sown with wheat after juar-tur stands first. Plot No. I sown every year with wheat stands second. Plot No. V sown with wheat after kodon stands third. Wheat sown in plot No. II after one year's fallow stands fourth, and plot No. III sown with wheat after gram stands the last. The absence of cold-weather rain renders the results misleading. Wheat sown after gram ought to have given better results as the soil is nitrogenized by the leguminous crop (gram) of the preceding year; but in the absence of moisture the plants do not get the full benefit of the accumulated food stored by the previous year's crop and therefore the results are discordant.

FIELD NO. 57. SUBJECT.—*Rotations with linseed.*

The former series of rotations has been abandoned because the outturns of linseed have been so poor, which has demonstrated the truth of the common agricultural practice that linseed cannot be grown in those rotations. Cultivators have suggested to me that linseed can be grown in a single rotation with coriander and I am now endeavouring to verify this suggestion. Coriander was grown in all the plots this season and linseed will be sown next season.

FIELD NO. 61. SUBJECT.—*Rotations with cotton and tur.*

Plot I.—Area ·30 acre. Cotton-tur year after year.
„ II. „ ·30 „ Cotton-tur in rotation with wheat.
„ III. „ ·30 „ Cotton-tur in rotation with gram.

Commenced in 1893 94. Unmanured unirrigated. For cropping, see column 2 below.

Number of plot.	Crop.	OUTTURN PER ACRE.									
		Average of preceding five years 1893-94 to 1897-98.		1898-99.		1899-1900.		1900-1901.			
		Grain or lint.	Straw or seed.	Grain or lint.	Straw or seed.	Grain or lint.	Straw or seed.	Grain or lint.	Straw or seed.	Value.	Cost of cultivation.
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	Rs. a. p.	Rs. a. p.
I	Cotton ...	36	78	82	188	41	74	260	417	70 4 0	16 7 4
	Tur ...	372	908	116	431	...	75	157	860		
II	Cotton ...	58	121	...	...	209	374	...	...	...	...
	Tur ...	621	1,595	...	....	42	362	...	...	...	...
	Wheat ...	388	653	426	740	...	...	489	1,204	37 14 5	16 7 4
III	Cotton ...	55	113	...	...	152	272	...	...	...	...
	Tur ...	511	1,322	...	...	18	282	...	...	...	...
	Gram ...	371	546	251	332	...	...	509	853	24 13 10	12 11 7

The object of the experiment conducted in this field is to ascertain whether it is more profitable to grow cotton-tur year after year in the same field, or, if a rotation is desirable, whether wheat or gram would be the most suitable crop to raise in every alternate year. Plot No. I was sown with six lines of cotton to two lines of tur, and although the tur crop was far below the average, the bumper outturn given by the cotton has nearly doubled the value of the outturn of the plot. The value of plots Nos. II and III, which were sown with wheat and gram, was less than plot No. I owing to the poorness of the wheat and gram crops.

V.—ROTATION EXPERIMENTS WITH MANURES.

Rotation with manure.

11. There are four fields in which experiments in manure and rotations are tried.

In fields No. 63 and 17 the experiment is designed to bring out the advantage of green manuring on a rotation of wheat and cotton. In field No 44, the effect of the various manures, stall-dung, box-dung and bone-dust, was tested on the following crops grown in rotation:—Cotton and wheat, wheat and tur.

The field lettered 42-N was devoted to an experiment to test the effect of phosphatic and potassic manures on tur (nitrogen-fixing crops) in rotation with wheat. The results attained this year in the case of each of these experiments are contrasted below with those of previous years:—

FIELD NO. 63. SUBJECT.—*Effect of green manuring with san-hemp (crotolaria juncea) on wheat with fallow interposed, and on wheat in rotation with cotton.*

Plot No. I.—Area ·22 acre. Green manuring followed by fallow and then by wheat.
„ „ II. „ ·22 „ As above, but unmanured.
„ „ III. „ ·22 „ Green manuring followed by wheat and then by cotton.
„ „ IV. „ ·24 „ As above, but unmanured.

Commenced in 1899 1900. No green-manuring in the year under report. For cropping see column 2 below.

Number of plot.	Crop.	OUTTURN PER ACRE.					Cost of cultivation per acre.	Remarks.
		1899-1900.		1900-1901.				
		Grain.	Straw.	Grain.	Straw.	Value.		
		lbs.	lbs.	lbs.	lbs.	Rs. a. p.	Rs. a. p.	
I	Wheat ...	Fallow ...	...	665	1,280	39 9 7	15 7 4	Green manured with san-hemp in 1899-1900.
II	Wheat ...	Fallow ...	...	595	1,064	35 2 2	15 13 9	
III	Cotton (Jari) ...	Wheat not sown.	...	477	764	112 13 5	26 7 1	Ditto.
IV	Cotton (Jari) ...	Do.	...	537	862	127 0 10	23 13 5	

The experiment has only just been started and no definite conclusion can be drawn. The wheat in plot No. I, which was green manured with san hemp and allowed to lie fallow, has given a fair outturn considering the dryness of the season. Plot No. II which was left only fallow has produced a crop less in value by Rs 4-7-5 than plot No. I. The green manuring in plot No. III in the last year has not produced any effect on the cotton crop of this year. The outturns of cotton in the plots Nos. III and IV are really phenomenal and such a bumper crop has never been produced on the Farm since it was started.

FIELD NO. 17. SUBJECT.—*Effect on wheat and cotton in rotation of green-manuring with kadoojira (Vernonia cineria).*

Plot I.—Area ·15 acre. Green-manured with cut weeds every alternate year.
„ II. „ ·08 „ No manure.

Commenced in 1890-91. Unirrigated. Crop—Wheat (*haura*—Nagpur) in year under report.

Number of plot.	Crop.	OUTTURN PER ACRE.														Cost of cultivation per acre.	Cost of manuring per acre.
		Average of preceding five years, 1890-91 to 1894-95.		1895-96.		1896-97.		1897-98.		1898-99.		1899-1900.		1900-1901.			
		Grain or lint.	Straw or seed.	Lint.	Seed.	Grain.	Straw.	Lint.	Seed.	Grain.	Straw.	Lint.	Seed.	Grain.	Straw.	Value.	
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	Rs. a. p	Rs. a. p.	Rs. a. p.
I	Wheat ...	569	1,246	...	...	233	447	...	...	454	826	...	...	627	1,199	37 4 11	17 6 4	7 2 5
	Cotton ...	58	141	134	262	...	...	130	281	...	...	219	392	...	...	...		
II	Wheat ...	347	816	...	...	120	192	...	...	332	605	...	...	381	719	22 10 1	21 5 8	...
	Cotton ...	43	112	109	208	...	...	106	244	...	...	185	332	...	...	...		

The results this year agree with those of the previous year and the green-manure was decidedly beneficial to the wheat crop.

FIELD NO. 44. SUBJECT.— *Relative effect on cotton and wheat in rotation of box-dung, stall-dung and bone-dust.*

Plot I.—Area ·27 acre. Manured with stall-dung at 160 maunds per acre.
„ II. „ ·27 „ Manured with box dung at 240 maunds per acre.
„ III. „ ·27 „ Unmanured.
„ IV. „ ·27 „ Manured with bone-dust at 360 lbs. per acre.

Commenced in 1890-91. Unirrigated. Crop—Cotton (jari) in year under report.

Number of plot.	Crop.	OUTTURN PER ACRE.															Cost of cultivation per acre.	Cost of manuring per acre.	Gain in value on plot No. III.
		Average of preceding five years, 1890-91 to 1894-95.		1895-96.		1896-97.		1897-98.		1898-99.		1899-1900.		1900-1901.					
		Grain or lint.	Straw or seed.	Grain.	Straw.	Lint.	Seed.	Grain.	Straw.	Lint.	Seed.	Grain.	Straw.	Lint.	Seed.	Value.			
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
I	Cotton ...	44	106	...	...	117	283	...	...	172	395	...	...	600	967	141 15 11	17 9 9	14 4 9	105 2 6
	Wheat ...	515	897	740	1,030	...	...	555	850	...	...	Wheat not sown.		...	...	...	...	...	...
II	Cotton ...	59	137	...	...	218	493	...	...	215	493	...	...	741	1,196	175 6 1	21 13 5	12 5 4	138 8 8
	Wheat ...	643	958	868	1,321	...	...	656	1,618	...	...	Wheat not sown.		...	...	...	...	...	...
III	Cotton ...	25	53	...	...	41	99	...	...	49	113	...	...	156	244	36 13 5	18 7 4	...	...
	Wheat ...	349	464	279	458	...	...	218	579	...	...	Wheat not sown.		...	...	...	...	...	...
IV	Cotton ...	24	50	...	...	32	70	...	...	53	123	...	...	137	226	32 7 8	18 6 5	3 6 0	4 5 9
	Wheat ...	284	683	242	448	...	...	174	534	...	...	Wheat not sown.		...	...	...	...	...	...

The outturns of cotton in plot Nos. I and II manured with stall-dung and box-dung are extraordinarily heavy. The outturn and value of the plot manured with box-dung are larger than those of the plot manured with stall-dung. Plot No. IV manured with bone-dust derived no benefit from the manure.

FIELD NO. 42-N. SUBJECT.—*Effect on tur and wheat grown in rotation of potassic and phosphatic manures.*

Plot I.—Area ·15 acres. Manured with powdered bones 360 lbs. per acre and potassic sulphate 90 lbs. per acre.

„ II. „ ·15 „ Unmanured.

Commenced in 1896-97. Crop—Tur in year under report.

No. of plot.	Crop.	OUTTURN PER ACRE.											
		1896-97.		1897-98.		1898-99.		1899-1900.		1900-1901.			
		Grain.	Stalks.	Grain.	Straw.	Grain.	Stalks.	Grain.	Straw.	Grain.	Stalks.	Value.	Gain on plot No. II.
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	Rs. a. p.	Rs. a. p.
I	Tur ...	756	1,422	...	...	564	1,020	...	...	683	1,903	34 15 6	9 15 1
	Wheat ...	...	...	414	899	...	...	Wheat not sown.		...	...	...	...
II	Tur ...	656	1,372	...	...	525	945	...	...	892	2,115	44 14 7	...
	Wheat ...	...	...	397	810	...	...	Wheat not sown.		...	...	...	...

According to the experience of the past four years the outturn of plot No. I manured with potassic sulphate and powdered bones ought to have been larger than plot No. II, but the reverse is the case. The experiment has been vitiated by the damage done by caterpillars to the tur crop in plot No. I. The caterpillars attacked more freely the thick plants in plot No. I than the poor plants of plot No. II.

VI.—EXPERIMENTS WITH MIXTURES OF CROPS.

Mixtures of crops.

12. These experiments were started with the object of testing the expediency of the practice of cultivators of the province in growing crop mixtures. Two fields were allotted for conducting these experiments. The experiment in field No. 25 of mixing gram and wheat, known in the Nerbudda valley as *birra*, was commenced in 1890-91; while the experiment of mixing (1) juar and cotton, and (2) cotton and tur in field No. 55 was begun in 1893-94. The results attained this year in the case of each of these experiments are contrasted below with those of previous years.

FIELD NO. 25. SUBJECT.—*Effect of mixing crops, wheat and a leguminous crop (gram).*

Plot I.—Area ·21 acres. Wheat sown alone.

„ II. „ ·21 „ Wheat mixed with gram.

Commenced in 1890-91. Unmanured and unirrigated. Crop—Wheat (*harra*—Nagpur) and gram.

No. of plot.	Crop.	OUTTURN PER ACRE.															
		Average of preceding five years, 1890-91 to 1894-95.		1895-96.		1896-97.		1897-98.		1898-99.		1899-1900.		1900-1901.			
		Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Value.	Cost of cultivation.
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.			lbs.	lbs.	Rs. a. p.	Rs. a. p.
I	Wheat ...	420	616	383	478	150	288	345	646	176	352	Wheat not sown.		157	367	9 9 5	14 6 2
II	Wheat ...	290	458	266	422	93	240	275	496	110	195			145	284	9 6 3	14 1 5
	Gram ...	161	275	53	95	62	147	105	152	48	123			13	53		

The two plots of this field are highlying and when the cold-weather rains fail both the crops suffer equally. If the outturns of these plots are compared with the average of the preceding five years, a great decrease will be observed. The same conclusion, however, holds good that on the farm soil a mixture of wheat and gram is not such a good crop as wheat alone.

FIELD NO. 55. SUBJECT.—*Effect of mixing crops, principal one being cotton, with tur and juar.*

Plot III.—Area '27 acre. Cotton (Jari) alone.
„ IV. „ '27 „ Cotton (Jari) and tur in the proportion of 6 lines to 2.
„ V. „ '27 „ Cotton (Jari) and juar in the proportion of 6 lines to 2.

Commenced in 1895-96. Unmanured

No. of plot.	Crop.	OUTTURN PER ACRE. 1895-96. Grain or lint.	1895-96. Straw or seed.	1896-97. Grain or lint.	1896-97. Straw or seed.	1897-98. Grain or lint.	1897-98. Straw or seed.	1898-99. Grain or lint.	1898-99. Straw or seed.	1899-1900. Grain or lint.	1899-1900. Straw or seed.	1900-1901. Grain or lint.	1900-1901. Straw or seed.	1900-1901. Value.	Cost of cultivation per acre.	Gain or loss in value on plot No. III.
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	Rs. a. p.	Rs. a. p.	Rs. a. p.
III.	Cotton ...	107	202	50	125	91	209	86	198	37	66	359	581	84 15 9	18 4 7	...
IV.	Cotton ...	63	125	23	47	55	127	87	200	37	66	193	311	84 15 1	21 7 1	—2 0 8
	Tur ...	487	966	461	717	716	1,273	297	687	...	45	787	1,779			
V.	Cotton ...	49	94	24	57	41	107	63	145	31	55	167	267	77 3 9	*15 2 7	—7 12 0
	Juar ...	218	1,346	191	1,050	378	2,174	330	1,026	...	489	721	2,211			

* Excluding cost of watching.

Owing to the high prices ruling for cotton and the bumper yield which the crop gave, plot I stands first in point of profit in the year under report. In the preceding years cotton grown with juar or tur gave more profitable results than cotton alone, which was due to the lower prices and smaller yields of cotton.

VII.—EXPERIMENTS WITH TILLAGE.

Tillage.

13. The first experiment was started in 1890-91 in order to test the practice of the cultivators, who merely scarify the ground for sowing wheat. The field is divided into three plots. The first plot is ploughed every year; the second is scarified (bakhared) every year, and the third is ploughed and scarified in alternate years. In accordance with instructions conveyed in paragraph 3 of Secretariat letter No. 869, dated the 13th February 1897, the experiment is duplicated in field No. 22.

A new experiment was added under this head in order to observe the effect of tillage to various depths on wheat.

FIELD NO. 21. SUBJECT.—*Effect of tillage to various depths.*

Plot I.—Area '27 acre. Ploughed (with the Swedish plough) every year.
„ II. „ '28 „ Bakhared (scarified) every year.
„ III. „ '28 „ Ploughed (with the Swedish plough) and bakhared in alternate years.

Commenced in 1890-91. Unirrigated and unmanured. Crop—Wheat (*haura*—Nagpur).

Number of plot.	OUTTURN PER ACRE. Average of preceding five years, 1890-91 to 1894-95. Grain.	Average of preceding five years, 1890-91 to 1894-95. Straw.	1895-96. Grain.	1895-96. Straw.	1896-97 Grain.	1896-97 Straw.	1897-98. Grain.	1897-98. Straw.	1898-99. Grain.	1898-99. Straw.	1899-1900. Grain.	1899-1900. Straw.	1900-1901. Grain.	1900-1901. Straw.	1900-1901. Value.	Cost of cultivation per acre.	Gain in value on plot No. II.
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.			lbs.	lbs.	Rs. a. p.	Rs. a. p.	Rs. a. p.
I	398	761	340	472	76	161	273	549	92	321	Wheat not sown		253	392	14 11 6	16 4 2	2 11 6
II	503	1,031	306	459	98	193	192	560	161	274			205	338	12 0 0	15 9 5	...
III	582	1,073	480	712	154	272	289	768	206	468			295	520	17 6 4	17 3 11	5 6 4

FIELD NO. 22. SUBJECT.—*Effect of tillage to various depths.*

Plot I.—Area '28 acre. Ploughed (with the Swedish plough) every year.

„ II. „ '28 „ Bakhared (scarified) every year.

„ III. „ '28 „ Ploughed (with the Swedish plough) and bakhared in alternate years.

Commenced in 1897-98. Unirrigated and unmanured. Crop—Wheat (*haura*—Nagpur).

Number of plot.	Outturn per acre.									Cost of cultivation per acre.	Gain in value on plot No. II.
	1897-1898.		1898-1899.		1899-1900.		1900-1901.				
	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Value.		
	lbs.	lbs.	lbs.	lbs.			lbs.	lbs.	Rs. a. p.	Rs. a. p.	Rs. a. p.
...	368	850	579	748	Wheat not sown.		395	662	23 2 7	14 10 10	3 9 3
II ...	344	817	439	707			333	574	19 9 4	15 12 8	...
III ...	310	708	294	556			369	610	21 9 9	16 14 6	2 0 5

The results of field No. 21 are quite in accord with the results obtained on these plots during the last 10 years. The plot ploughed in alternate years shows a decided gain over plot I and II, which were respectively scarified and ploughed every year. In field No. 22 the results of the year under report are not as expected. In the years 1897-98 and 1898-99 the results of plot No. III were misleading, and it will require a few more years in order to ascertain whether the results will be like those obtained in field No. 21. One thing, however, may be noted, that the outturn of plot No. II of field No. 22, which is scarified every year, is diminishing:—

FIELD NO. 33. SUBJECT.—*Effect of tillage to various depths.*

Plot I.—Area '39 acre. Bakhared (scarified) every year.

„ II. „ '39 „ Ploughed by country nagar every year.

„ III. „ '39 „ Ploughed by the Swedish plough every year.

Commenced in 1900-1901. Unmanured. Crop—Wheat (*haura*—Nagpur).

Number of plot	Outturn per acre.			Gain in value on plot No. I.	Remarks.
	Grain.	Straw.	Value.		
	lbs.	lbs.	Rs. a. p.	Rs. a. p.	
I	361	627	21 4 0	...	
II	458	590	26 3 4	4. 15 4	
III	529	925	31 2 6	9 14 6	

I am unable to offer any remarks on the results of this experiment owing to its having been started in the year under report; but deep ploughing was beneficial this year.

VIII.—EXPERIMENTS WITH SELECTION OF SEED.

Selection of seed.

14. There was one experiment tried in the year under report under this head. In field No. 40, plot No. I, unselected seed was sown, while in plot No. II big plump selected seed was sown. The selected and unselected seeds were sown in equal quantities.

The results are noted below:—

FIELD NO. 40. SUBJECT.—*Effect of Selection of Seed.*

Plot I.—Area '12 acre. Unselected seed.
„ II. „ '12 „ Selected seed.
Commenced in 1900-1901. Crop—Wheat (*haura*—Nagpur).

Number of plot.	Outturn per acre.			Gain in value on plot No. I.	Remarks.
	Grain.	Straw.	Value.		
	lbs.	lbs.	Rs. a. p.	Rs. a. p.	
I	831	1,277	48 4 10	...	Manured with road sweepings in year under report.
II	1,082	1,709	63 1 0	14 12 2	

The plot sown with the selected seed yielded a profit of Rs. 14-12-2 over the plot sown with unselected seed. The plants in plot No. II freely tillered, while the same was not the case in Plot No. I.

IX.—VARIETY OF CROPS.

Variety of crops.

15. The different crops grown on the farm during the year under report were bajri (pennisetum typhoidum), sorghum (amber and collier), cotton of different kinds, maize, sorghum halipense, paspalum dilatatum, broom corn, rice early and late.

Bajri.

16. Out of the five varieties experimented with in previous years, the awned variety was selected as the most suitable and was sown for the purpose of collecting seed for distribution to districts.

Sorghum.

17. Sorghum (amber and collier) were also sown in waste places and a large quantity of seed was collected for future distribution. The plants come to maturity very early and in consequence are very valuable as a fodder crop. The rest of the crop was used for making ensilage.

Sorghum halipense, another fodder crop, suffered very badly in the drought of 1900: a few clumps have, however, again grown and have seeded. It is to be seen whether the clumps will spread next year.

Cotton.

18. The varieties of cotton grown on the Farm were Jari, Bani, Nimari, Upland Georgian, Gar and Egyptian. The Egyptian cotton was again sown this year in the month of October. In plot No. $\frac{35}{1}$ the cotton was mixed with gram and in plot No. 38 it was mixed with peas. The growth of the cotton plants up them, but this was not the case with the cotton plants which shared the ground with saw hampered by the peas climbing gram. After the peas and gram were reaped a watering was given to both the plots and the plants are thriving very well, although they yielded no cotton in the hot weather. I expect however to get a bumper crop this winter and again in the summer of 1902. That part of field No. 38 which was sown in October 1899 gave during the period March to June 1900 an outturn of 40 lbs. of uncleaned cotton per acre. The same plants gave an outturn of 360 lbs. per acre of uncleaned cotton during the period September to December 1900. The same plants were manured in February 1901 and were irrigated, and gave an outturn of 101 lbs. of uncleaned cotton per acre during the months from April to June 1901. These plants have been allowed to occupy the ground again this year, as I wish to ascertain whether the fibre deteriorates by prolonging the growth of the plant.

Samples of the cotton were sent to the Manager, Empress Mills, Nagpur, for transmission to Messrs. Carver Brothers and Co., of Alexandria. The opinion and valuation given by this Firm are reproduced below:—

We have duly received your favour of the 18th instant with the cotton samples referred therein. We estimate them as follows:—

Metafifi, clean, R. I. B. Grade—Good brown colour, strong staple and fine, some good length, but mixed with short. This irregularity is the prejudice of the cotton. Value 7⅞—8. C. I. F., Bombay.

Abassi.—Creamy white colour, but the class is damaged by tinged bits and imperfections. Staple fairly long and strong, but some of the original fineness is lost; less irregularity of length than in the Metafifi. Nominal value 9½—9¾ C. I. F., Bombay.

These productions on the whole give promise that the seeds could yield better results under cultivation similar to that practised in Egypt.

In forwarding the above letter to me, the Manager, Empress Mills, writes:—

With reference to my letter No. 5581 of the 11th January last, I have the pleasure to enclose herewith copy of our Alexandria friends' report on the subject of the Egyptian cotton grown by you in your Farm. You will notice that it is even more favourable than mine. The estimated prices work out at 7⅞*d*., 8*d*., 9½*d*., and 9¾*d*. per lb., as equal to Rs. 169-12-10, Rs. 172-8-0, Rs. 204-13-6 and Rs. 210-3-9 respectively per boja of 345 lbs. (cleaned cotton).

The quality of the Abassi variety was thus better than Metafifi, but the latter was the more prolific.

The Upland Georgian did the best of the other varieties of cotton.

19. Maize. Two varieties of maize—horsetooth (an American variety) and Jaunpur—were sown for seed purposes, and the stalks were utilized for ensilage. The Jaunpur variety is the better food crop, but the American variety has larger stems and is a better fodder crop.

20. *Paspalum dilatatum.* The Manager, Wollongbar Experimental Farm, forwarded to the Commissioner of Settlements and Agriculture, Central Provinces, India, some seed of *paspalum dilatatum* grass for trial. Part of the seed was sown on the farm and gave a good yield of fodder grass. Some of the seed was also sown at the beginning of the monsoon in the fuel and fodder reserves at Nagpur, which are situated on a low range of barren hills. This germinated well, but it dried up at the same time as the other local varieties of grass. The quality of the *paspalum* was, however, found to be superior to the grass which grows on the range of hills referred to above. It would seem that the grass does better on black soil than on stony hilly land. On the farm, the grass was cut some time last month, and it has begun to sprout again. This year's experience indicates that *paspalum dilatatum* does not resist drought, and is likely to thrive on the banks of rivers and streams where there is moisture throughout the year.

21. Broom corn. A small quantity of the seed of Broom corn was sent by the Manager of the Wollongbar Experimental Farm. It was sown in lines in a spare plot of land. The grain of this variety is very similar to that of sorghum, collier and amber, but is a little bigger in size. The stalks grow exactly like juar, but it does not bear compact heads of ears. The panicle which carries the seed has numerous stalks, all from a common centre, which, being long and wiry, are, after the removal of the seed, admirably adapted for use in the manufacture of brooms. I have had some brooms prepared from the stalks and they sweep very satisfactorily. In English and Australian markets there is a great demand for the stalks. The grain is edible but not as tasty as juar. The stalks are good fodder.

22. Rice. The early (halka) and late (chinur) varieties of rice were again grown this year with success. The early variety is worth while cultivating as it admits of an after crop of gram. It comes to perfection in 90 days and is not dependent on irrigation.

23. Ensilage. An experiment in ensilage was made in the year under report with maize stalks. A pit measuring 5′ × 4′ × 4′ was dug in the floor of one of the sheds of the Farm. The stalks and leaves were chopped into small pieces by the ensilage fodder cutter, an American machine, and was pitted. This operation lasted for one week, and the pit was covered over with a foot of earth well rammed. Another stack was built on a platform of earth raised two feet above the ground level. The stack was oblong and measured 12′ × 15′. It was built of the stalks of sorghum, collier and amber, and when completed attained a height of 15 feet. A layer of green grass of 2 feet thick was spread on the top and big logs of wood were afterwards laid on top of it to press it down. Both the silos were opened on the 20th of April, and dried samples were sent to Dr. Leather, Agricultural Chemist to the Government of India, for analysis. His report is reproduced below:—

Report on the composition of two samples of silage sent by the Superintendent, Government Experimental Farm, Nagpur.

	122—01 Maize silage (below ground).		123—01. Sorghum collier silage (above ground).	
	Fresh state.	Air-dry.	Fresh state.	Air-dry.
Water	*18·78*	7·66	*60·52*	5·72
Fat and wax	*·21*	1·07	*·65*	1·55
Albuminoids	*·77*	3·93	*1·89*	4·53
Soluble carbohydrates	*9·44*	48·02	*21·37*	51·10
Woody fibre	*5·50*	28·06	*11·29*	26·87
Soluble mineral matter	*1·10*	5·60	*1·59*	3·80
Sand	*1·11*	5·60	*2·69*	6·43
	100·00	100·00	*100·00*	100·09
Nitrogen—Total	*·17*	·90	*·33*	·79
Do. Albuminoid	*·12*	·63	*·30*	·72

The figures in black ink* show the composition of the silages in the fresh state. But they are not readily comparable in this condition, as the maize silage contained very much more water than the sorghum silage. The former contained 81 per cent. water, and therefore 19 parts of dry food material; the sorghum 60 parts of water and 40 parts of dry material per 100 pounds. In the air-dry condition, however, they are more nearly comparable with one another, and as the red-ink † figures show, there is not very much difference between them. The sorghum contains somewhat more albuminoids, but this is the only *material* difference. The sorghum silage compares very favourably with European silage. That the maize silage should contain less albuminoids is not surprising, since during the ripening of the grain there is transference of this material to the grain from the stem. The sorghum was cut, on the other hand, before the grain was ripe and the latter was included in the fodder, and the proportion of albuminoids is thus materially higher.

* Printed in italics. † Printed in antique types.

An extract from the *Agricultural Gazette* of New South Wales, July 1898, Part 7, Volume IX, is reproduced below, as it gives a full description of the method for preparing ensilage above ground:—

The Department has been advised that a large stock of ensilage which Mr. Thompson supervised the building of at Mr. William Yabsley's Farm, Coraki, Richmond River, last summer, has been opened, and the fodder found in excellent condition.

"The following are details of the system followed by Mr. Thompson:—Maize and all other crops intended for ensilage should be fully grown, but quite green and full of succulence, the cob well formed and in the milky condition. It should be cut quite close to the ground, and left on the land in armfuls, and kept as straight as possible. The sooner it is carted to the stack after being cut the better; low dray or sledges will be found most convenient for this work A site for the stack should be selected as high and dry as possible. A straight trench should be cut 9 inches deep right round the foundation and run gradually out to nothing, and the earth so removed should be spread evenly over the foundation, thus raising it above the ordinary level. If possible a small drain should be constructed to carry off the water accumulating in the trench. With regard to the size of the foundation of the stack, care must be taken not to make it too large for a given quantity of material; otherwise when consolidated the stack will be too low, and there will be consequently more waste. One hundred tons of ensilage can be built on a foundation 21 × 18 feet, and a 20 ton stack would not require more then 9 × 8 feet. The larger the stack and the higher it is built the less waste, and *vice versa*. A foot of summer grass or green rubbish of any kind should be put on the foundation. This will take the mould and save the good material from waste. In building, stalks should all be laid as far as possible one way, so as to pack better, and with a small stack they must be laid fore and aft, or the long way of the stack with the exception of an armful here and there to bind the stuff more compactly. By building slowly the stack will keep sinking and consequently the stuff will not require to be lifted so high. When a large quantity of ensilage is being made some mechanical contrivance should be arranged to hoist the material from the dray on to the stack, but for a small stack of course, it would not be worth while erecting it. A straight pole should be put into the ground 4 feet deep and about 10 feet above ground at each corner of the stack, and one at each side, perfectly plumb, as a guide for the builder. This will assist greatly in enabling him to keep the stack in good shape. After all the material is put on the stack, at least 2 feet deep of green grass or rubbish of any kind should be put on top. This will take the mould, and will help to weigh down the material and save the good fodder. Although there are some excellent mechanical appliances for giving the necessary pressure, such as Johnson's patent, for a small stack nothing can equal dead weight. This may consist of blocks of wood, posts and rails, earth in bags, or any material that will give sufficient pressure to weigh down the stack. From 150 to 200 lb. per square foot will be required to give the necessary weight. Above the weights should be arranged some sort of covering to keep out the rain—either a tarpaulin or a few sheets of iron. No water must enter the stack either at the bottom or the top, otherwise the ensilage will be spoiled. If there are any straggling stalks projecting from the stacks, they should be neatly trimmed off with a sharp hay-knife.

Some of the advantages of ensilage as described in the *Cotton Planter's Journal* of February 15th, 1901, are given below:—

The following are some of the reasons why ensilage should be more generally used:—

(1) In a first class silo the crop can be preserved in very much the same condition as when growing in the field; that is, it retains its succulence and has a greater palatability than if cured as stover. While it is true that there is some loss in the silo, with proper precaution this can be reduced to a minimum, and will probably never exceed that occurring where the crop is cured in the field.

(2) The use of the silo, therefore, enables the farmer to feed, as it were, green food all through the winter season. This succulent food, as all know, has a greater apparent influence on animal production than its composition or digestibility would indicate. This is due in part to the fact that succulent foods keep the system relaxed and cooled and help to throw off *effete* material, and to aid the circulation of blood, which assists assimilation and hence the nourishment of the animal. Preserving ensilage in the silo does not increase its digestibility, nor will a pound of digestible matters in ensilage produce any more gain than a pound in corn fodder, but as already noted, it induces a larger consumption and has a much better influence on the health of the animal than the other.

(3) The silo enables the preservation of a great mass of food in a compact form and in a small space, and materially reduces the labour of handling the crop when once harvested.

X.—EXPERIMENTS WITH PLANT DISEASES.

Smut in juar.

24. The experiment of soaking juar seed in a solution of cupric sulphate before sowing as a preventive against the attacks of smut was a complete success. Not a single ear of juar grown on the Farm was found affected with the disease.

Wheat rust.

25. A field was allotted for the cultivation of different varieties of wheat to test their rust-resistent properties. But in the absence of the disease in unirrigated wheat on the Farm no conclusion can be drawn. The samples of Australian wheat received for experimental cultivation were sown on the 28th October 1900. The packets numbered 173. The seed in each packet was sown in a separate drill by hand-dibbling, the furrows being irrigated very lightly so as to facilitate speedy germination. All the seeds sprouted successfully and the plants were in a most vigorous condition. Some of them tilled so freely that I counted 20 offshoots from a single plant. The crop was irrigated on the 10th of November and on the 15th of December. On the 8th and 9th of January rain measuring ·13 and ·55 inches fell respectively.

On the 14th and 15th of the same month a rainfall of ·32 and ·13 inches followed. The rainfall was most beneficial to the plants, which grew very luxuriantly, and some of the plants were of a very nice dark-green bloom. There was not the least sign of rust on any of the varieties. On the 17th, 18th, 19th, 20th and 21st of January, rain measuring ·10, ·49, ·23, ·09 and ·07 inches respectively was registered on the Farm. On the 19th of February I saw some traces of rust on a few varieties. By the 24th of February almost all the plants were very badly rusted. Those that had advanced a little and had ears in which small grains had formed did not succumb so much to the disease as others which had only arrived at the flowering stage. Many of them died before coming to maturity. I opened a book with eight columns and the state of the plants in each of the furrows was entered. The varieties which were gathered by me are given in the statement below. I gather that these Australian varieties are all late varieties, and it is not possible for them to come to maturity without irrigation in our soils. The wheats which are generally grown in the Central Provinces are, with the exception of pissi, very early varieties. Pissi is very largely grown towards the north, where the soil holds moisture for a longer period. Only the varieties that were partially rusted were gathered. They are 39 in number and they are comparatively early. They had come to maturity before rust had an effect on them. I do not think that any of them are rust-resistent.

No.	Name.	Late or early.	Tillered.	Tall or dwarf.	Narrow or broad flag.	With or without awns.	Rusted.	Total or partial.
64 (*f*)	M and Hussar and Indian D.	Middle.	Not much.	Tall.	Broad.	Partially.	Rusted.	Partially.
64 (*f*)	Do. do. ...	Do.	Tillered.	Mixed.	do.	No awns.	do.	do.
64 (*f*)	Do. do. ...	Late.	do.	do.	do.	do.	do.	do.
64 (*f*)	Do. do. ...	do.	do.	do.	do.	do.	do.	Very little.
64 (*f*)	Do. do. ...	do.	do.	Tall.	do.	do.	do.	do.
64 (*f*)	Do. do. ...	do.	do.	do.	do.	do.	do.	do.
64 (*f*)	Do. do. ...	Middle.	do.	do.	do.	do.	do.	Partially.
124 (*f*)	Sirdar ...	Late.	do.	Mixed.	do.	do.	do.	do.
124 (*f*)	Do. ...	do.	do.	Tall.	do.	do.	do.	do.
124 (*f*)	Do. ...	do.	do.	do.	do.	do.	do.	do.
124 (*f*)	Do. ...	do.	do.	do.	do.	do.	do.	do.
124 (*f*)	Do. ...	do.	do.	do.	do.	do.	do.	do.
124 (*f*)	Do. ...	do.	do.	do.	do.	do.	do.	do.
124 (*f*)	Do. ...	do.	do.	do.	do.	do.	do.	do.
132 (*f*)	Kinley and N. L. D. ...	Middle.	do.	Mixed.	do.	do.	do.	do.
134 (*f*)	Do. do. ...	do.	do.	do.	do.	Small awns.	do.	do.
132 (*f*)	Do. do. ...	do.	P. tillered.	do.	do.	No awns.	do.	do.
132 (*f*)	Do. do. ...	do.	Tillered.	Tall.	do.	Small awns.	do.	do.
32 (*f*)	Do. do. ...	do.	do.	do.	do.	No awns.	do.	do.
47 (*e*)	Eden and Indian N. ...	do.	do.	Ordinary.	do.	do.	do.	do.
47 (*e*)	Do. do. ...	do.	do.	Mixed.	do.	do.	do.	do.
47 (*e*)	Do. do. ...	do.	do.	Dwarf.	Narrow.	do.	do.	do.
119 (*b*)	Kinley ...	Middle.	do.	Tall.	Broad.	do.	do.	do.
50 (*c*)	Eden and Indian K. ...	do.	do.	Ordinary.	do.	do.	do.	do.
50 (*c*)	Do. do. ...	do.	do.	Tall.	do.	do.	do.	do.
45 (*e*)	Eden and Jondhala ...	Late.	do.	do.	do.	Small awns.	do.	do.
45 (*e*)	Do. do. ...	do.	do.	do.	do.	do.	do.	do.
45 (*e*)	Do. do. ...	do.	do.	do.	do.	do.	do.	do.
45 (*e*)	Do. do. ...	do.	do.	do.	do.	do.	do.	do.
45 (*e*)	Do. do. ...	Middle.	do.	do.	do.	do.	do.	do.

No.	Name.	Late or early.	Tillered.	Tall or dwarf.	Narrow or broad flag.	With or without awns.	Rusted.	Total or partial.
45 (e)	Eden and Jondhala ...	Late.	Tillered.	Tall.	Broad.	Small awns	Rusted.	Partial.
45 (e)	Eden and Maize wheat ...	do.	do.	do.	do.	do.	do.	do.
45 (e)	Eden and Jondhala ...	do.	do.	do.	do.	No awns	do.	do.
45 (e)	Do. do. ...	Middle.	do.	do.	do.	do.	do.	do.
45 (e)	Do. do. ...	Late.	do.	do.	do.	do.	do.	do.
45 (e)	Do. do. ...	do.	do.	do.	do.	Small awns	do.	do.
45 (e)	Do. do. ...	do.	do.	do.	do.	do.	do.	Very little.
45 (e)	Do. do. ...	do.	do.	do.	do.	do.	do.	do.
43 (e)	Do. do. ...	Middle.	Not much	Mixed.	do.	do.	do.	do.

Another experiment was tried in order to test the statement that the ravages of wheat rust can be mitigated by the sowing of two year's old wheat seed; but as there was no rust during the year it was not possible to test the truth of the statement.

The cross-bred variety of haura-mundia pissi was grown and yielded well with good quality grain, but in the absence of rust in local varieties, its rust-resistent quality was not tested.

XI.—METHODS OF CULTIVATION.

Methods of cultivation.

26. Experiments of digging trenches between rabi crops and trees in their vicinity in order to save the latter from the loss of moisture otherwise absorbed by the surface roots of the trees, were continued with successful results.

XII.—TRIAL OF IMPLEMENTS.

Implements.

27. All the implements tried last year were tried again in the year under report. A new implement known as the Ensilage Fodder Cutter and Shredder, of American manufacture, was added to the stock. It is a labour-saving machine and a very useful implement for cutting juar stalks into quarter inch lengths which cattle eat with great avidity. It effects a great saving in fodder as nothing is wasted. It cuts very fast and is easy to work, a man working at the machine for half a day being able to produce chopped food for 30 head of cattle. It is also a very good machine for cutting maize stems into lengths which may then be buried in the ground. A very sweet silage is thus prepared out of material that would otherwise be wasted.

XIII.—DISTRIBUTION OF SEEDS AND IMPLEMENTS.

Distribution of seeds and implements.

28. In the year under report seeds and implements were distributed to the undermentioned gentlemen:—

Seeds.

Description of seed.	To whom supplied.
Maize seed.	Assistant Settlement Officer, Sambalpur.
Maize seed, ambari seed, san-hemp seed, sorghum seed, and Egyptian cotton seed.	Mr. N. G. Mukerji, Manager, Sibpur Farm, Calcutta.
Nimari cotton seed, Bani cotton seed and Upland Georgian cotton seed.	Mr. Meharbansing, Schoolmaster, Singhpur, District Narsinghpur, for the use of a local malguzar.
Maize seed, juar seed, big castor seed ...	Mr. Raghoba Ratiram, malguzar of Saoner.
Nimari cotton seed, Jari cotton seed and paddy seed ...	Mr. Venkatesh Govind Zinjarde, malguzar of Mandhal, District Nagpur.
Safflower seed	Superintendent, Agricultural Demonstation Farm, Trevandrum
Upland Georgian cotton seed	Mr. Saligram, Kalar, tenant of Nand, District Nagpur.
Paddy seed	Mr Gajfar Hoosain, Malguzar of Besa, District Nagpur.
Maize seed, ambari seed and til seed	Mr. Pandurang Daji Gogte, cultivator of Nagpur.
Jari-cotton seed, juar seed, tur seed and ambari seed ...	Mr. Ramaswamy, cultivator of Nagpur.
Maize seed, ambari seed, small and big castor seed ...	Mr. Seonarayan Marwari, cultivator of Nagpur.
Egyptian cotton seed	Director of Land Records and Agriculture, Bengal.
Do.	Deputy Commissioner, Betul.
Do.	Secretary, Agricultural Association, Paltan State, Bombay Presidency.

Implements.

Description of implements.	To whom supplied.
Swedish plough	Mr. Buchu Miya, Malguzar of Waigaon, Tahsil Hinganghat, District Wardha.

XIV.—CATTLE-BREEDING.

Cattle-breeding.

29. The Mysore bull kept at the Farm has become too old for breeding purposes, but continues to be worked on the Farm in drawing the plough.

XV.—FODDER AND FOREST RESERVES.

Fodder and Forest Reserves.

30. Endeavours were made to remedy some of the damage caused by the loss of trees in the drought by sowing more seed, which germinated well, and some of the seedlings are still thriving. Plants of the Ceæra rubber tree were put out, but these all died as it was impossible to irrigate them.

The Farm and Gardens continue to draw their supply of grass from the Reserve. The receipts and expenditure of the Reserve are as follows :—

Expenditure.

	Rs. a. p.
Pay of 2 chowkidars in 1900-1901 ...	*132 4 0

Receipts.

(1) Value of grass supplied to Farm and Garden ...	190 0 0
(2) Value of grass sold to the public ...	651 9 3
Total ...	841 9 3
Deduct cost of establishment ...	132 4 0
Net profit	709 5 3

* Excluding charges for compensation for dearness of grain.

XVI.—SEWAGE FARM.

Sewage Farm.

31. The season was favourable for the crops of the Kachi cultivators and they have reaped good harvests in both the seasons. The receipts and expenditure of the Sewage Farm during the year under report are given below :—

Receipts.	
Rent including water-rate collection due in 1900-1901.	Expenditure in 1900-1901.
Rs. a. p.	Rs. a. p.
1,062 10 6	884 2 6

It is noteworthy that this is the first year in which the Sewage Farm has shown a profit.

XVII.—AGRICULTURAL CLASS.

32. The working of the Agricultural Class, Nagpur, has been separately reported upon. There were 13 students in the Senior Class and 7 in the Junior Class. Out of the 13 senior, 11 appeared for the final examination. The student who passed first last year was not chosen for the Poona Science College as he did not show any special aptitude for the agricultural branch and left the school in December last. One of the junior students also left the school as he thought that his chances of coming out first in the annual examination were very small. All the others appeared for the examination. There are one F. A., 4 matriculated students and one Middle School pass in the Junior Class.

As usual each student of the Senior Class was given two plots (each $\frac{1}{4}$th of an acre) for the cultivation of kharif and rabi crops. The Junior students were given similar plots for cultivation of the cold-weather crops. All the operations from the preparation of the ground to the threshing of the crops were carried out by the students themselves. The senior class students sowed cotton and juar as kharif crops, and til and wheat as rabi crops, and the juniors sowed wheat and gram mixed as a rabi crop. Sowings of cotton were completed in good time When the plants were three inches high they were thinned out and weeded.

In the beginning the plants showed no signs of success and the lowlying plots remained submerged during the heavy rainfall of July and the first half of August, but after the 15th of August hoeing was possible and the prospects of the crops much improved. The highest outturn of cotton was 1,332 lbs. per acre, the lowest was 446 lbs. and the average was 945 lbs per acre. If we compare these outturns with the average outturn of the district, which is 240 lbs. per acre, we can safely say that the crop was nearly four times the average. Such a crop of cotton was never gathered before. More than half the cotton was sold when the price of cotton was Rs. 53 to Rs. 57 per khandy of 656 lbs. (uncleaned cotton), but now the price has fallen to Rs. 35 per khandy. The juar crop was a fair one; the yield was 788 lbs. of grain and 1,660 lbs. of karbi per acre. The total failure of rain from October till February retarded the growth of the rabi crops and caused them to mature early, and thereby the outturn was much below expectation. The crop of wheat was much damaged, especially by crows and rats. The area covered by the crops was as follows :—

Kharif crops.

Cotton	...	...	...	2½ acres.
Juar	...	...	...	¼ acre.
			Total ...	2¾ acres.

Rabi crops.

Til	...	...	...	¾ acre.
Wheat	...	...	...	2 „
Wheat and gram	...	...	...	1½ „
			Total ...	4¼ „

The total area which the students had under cultivation was 7 acres and the sale-proceeds were appropriated by the students themselves according to the outturn of their own plot. The class was visited by several visitors. The principal visitors were the Hon'ble Mr. A. H. L. Fraser, I. C. S., C. S. I., Chief Commissioner; Mr. T. W. Holderness, Revenue Secretary to the Government of India; Mr. J. B. Fuller, I. C. S., C. I. E., Commissioner, Jubbulpore Division; Mr. Wright, the Director of Land Records and Agriculture, Bengal; Sir E. C. Buck, K. C. S. I., on special duty with the Government of India; Mr. L. S. Carey, I. C. S., Commissioner of Settlements and Agriculture, and Mr. C.H. Browning, the Inspector-General of Education, Central Provinces. The Hon'ble the Chief Commissioner in the remarks recorded by him condemned as insanitary and inconvenient the present situation of the three boarding-houses, and suggested that a new boarding-house for all the students on some airy site in or close to the Model Farm should be erected. The matter has been taken up by the Director of Agriculture and the Inspector-General of Education, Central Provinces.

Sir E. C. Buck's remarks are as follows :—

In connection with agricultural teaching the position is, in the Central Provinces, satisfactory. In the first place the great principle followed in Germany that education should be based on lessons given in connection with Haimat Kunde (Familiar surroundings) is fully observed. There is an excellent Government Farm at Nagpur which is utilised for purpose of instructions. All Village Schoolmasters and now all candidates for Normal Schools are passed through a six months' course and taught at the same time to give lessons on agricultural objects in a practical manner. I heard lessons from the Reader given to a practice class of boys and nothing could have been better done. Practical illustrations were given at every step. Kanungoes are passed through a two years' course on the Farm, but are not of course required to be trained in giving lessons. Managers and Assistant Managers of Court of Wards Estates, who have passed through the school, in some cases through the Poona College, are men competent to give a more extended trial of the assumed improvement on different soils and under differing conditions.

The Commissioner of Settlements and Agriculture suggested during one of his several visits that the students should be taken to villages round about Nagpur and the Civil Station and shown the serious damages done to juar this year by "smut." The students of all the classes were taken to several villages, and the diseased ears were counted in a large number of fields and an average was struck out for all of them. The computation made on the statistics thus obtained was that the average loss was Rs. 4 worth of grain per acre. A successful experiment on the Farm in steeping the grain in a solution of copper sulphate was clearly demonstrated to the students.

The annual examinations were held on the 18th March 1901 and subsequent da The following gentlemen kindly acted as examiners :—

Subject.	Examiners.
Chemistry (Theory and Practice) Botany Geology	Revd. Dr. Alex. Robertson, M. B., Professor, Hislop College, Nagpur.
Agriculture (Theory) ...	Mr. B. V. Joshi, D. Ag. (Bombay), Assistant Instructor, Normal Agricultural Class, Nagpur.
Veterinary ...	Mr. C. Pillay, G. B. V. C. (Bombay), Veterinary Instructor, Nagpur.
Surveying (Theory and Practice) ...	Mr. Narayan Rao, Superintendent of Land Records, Nagpur.
Drawing ...	Mr. S. V. Sathe, Drawing Master, Training Institution, Nagpur.

I examined the students in Practical Agriculture. Out of the 11 seniors and 6 juniors who appeared for the examination, 9 seniors and 5 juniors duly passed the prescribed standard of the examination. All of the juniors have been promoted to the senior class. The students were also trained in writing land records. The students Bhaya Lall and Nand Kishore, who were selected for the Science College, Poona, in 1899 and 1900 respectively, have passed the 2nd and the 1st examination in Agriculture respectively of the Bombay University.

There are two divisions of the Normal Agriculture Class, one of which is situated in the buildings attached to the Agriculture Class, Nagpur, and the other in the Training Institution, Takli. There was no change in the teaching staff. Both the classes were opened in June 1900. The first batch consisted of 50 schoolmasters, out of whom 49 appeared for the final examination held on the 28th October 1900, and one was absent on sick leave. 43 passed the prescribed test and obtained certificates.

The second session of the Class opened in November 1900 with 67 students. Out of these 30 were schoolmasters from different districts and 37 were ex-students of the Jubbulpore, Raipur and Nagpur Normal Schools. Four students left the class before the examination took place. The remaining 63 appeared for the examination held on the 30th March 1901, and 52 passed the prescribed test and obtained certificates.

XVIII.—FINANCIAL RESULTS.

33. The expenditure and receipts of the year are shown below:—

	Expenditure.			Receipts.	Net cost.
	Salaries.	Contingencies.	Total.		
	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
Budget ...	4,788 0 0	4,550 0 0	9,338 0 0	2,500 0 0	6,838 0 0
Actuals ...	*4,508 10 10	2,902 8 8	7,411 3 6	2,773 4 9	4,637 14 9

* Including compensation for dearness of grain to Farm servants.

A detailed statement showing the various items of receipts and expenditure is printed as Annexure D.

TELINKHERI FARM.

34. History. The Telinkheri Garden was originally one of the Raja's gardens, and was after the annexation of the Nagpur country declared nazul, *i. e.*, property of the State. The Telinkheri Garden was retained and continued to be managed by the Local Fund Committee until it was handed over to the Forest Department in 1872. In placing the garden under the management of the Forest Department Sir John Morris, then Chief Commissioner of the Central Provinces, gave that Department a large area attached to the gardens for the purpose of an experimental plantation. In making over the garden and the adjacent lands to the Forest Department, the Chief Commissioner had a twofold object in view, namely, first, that a well-preserved plantation of forest trees with good roads running through it and an ornamental garden in its midst would afford the public a pleasant place of recreation and would be greatly appreciated by the residents of the station; and, second, that one-fourth of the plantation would in course of time provide fuel and building timber to the Nagpur city. The Forest Department succeeded in raising a good growth of forest trees on the larger portion of the area received for the purpose, keeping a smaller portion for the cultivation of food crops. In later years the Forest Department have honeycombed the plantation by bringing several strips of land situated in different parts of the plantation under cultivation.

Management. The management of the Telinkheri Farm was taken over by me on the 1st of June 1899. The establishment that has been entertained to work the Farm consists of—

	Rs.	
1 Overseer	30	per mensem.
1 Jamadar	6	,,
2 Chowkidars	6 each	,,
11 Ploughmen at rates of pay, *viz.* ...	5 & 6	,,
Total annual cost of establishment...	1,308	

The Farm is situated about two miles from Nagpur. The land is very uneven and stony in parts. 75·42 acres are under cultivation, the rest being occupied by forests and grazing lands. The fields are thoroughly drained.

The only experiment conducted at Telinkheri Farm was to test the different methods practised in the Provinces of cultivating rice. The following table gives the outturn of paddy sown according to the different methods :—

Method of sowing.	Area.	Outturn of paddy per acre.
	Acres.	lbs.
Sown broadcast ...	·25	891
Sown by a seed drill ...	·27	613
Sown broadcast but transplanted.	·27	805
Sown broadcast but ploughed under, locally termed *Biyasi*.	·25	575

The land is not yet in a sufficiently good state of cultivation to render it suitable for experimental purposes.

The area and outturn of the following crops grown on the Farm is given below :—

Name of crops.	Area.	Outturn per acre.
	Acres.	lbs.
Cotton (jari) ...	24·28	299
Juar ...	15·98	457
Tur ...	2·52	1,331
Til (rainy) ...	7·48	119
Til (winter) ...	2·39	169
Paddy ...	1·00	880
Mote ...	3·11	48
Linseed ...	2·16	646
Gram ...	2·38	171
Castor ...	·75	501
Wheat ...	2·98	828
Safflower ...	3·11	246

It will take some few years to get the land into proper order, and the crops at present are much injured by weeds, especially *kans*.

Financial results. The expenditure and receipts of the year are shown below :—

	RECEIPTS.					EXPENDITURE.						
							CONTINGENCIES.					
	Commercial sale of produce.	Rent of Government land.	Sale of grass (bir).	Miscellaneous.	Total.	Establishment.	Seeds and plants.	Cattle.	Implements.	Feed and care of cattle.	Miscellaneous.	Total.
	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
Budget ...	...	...	...	...	1,867 0 0	1,128 0 0	50 0 0	...	...	340 0 0	85 0 0	1,603 0
Actuals ...	742 11 2	40 0 0	94 14 3	424 2 0	1,301 11 5	*1,081 15 3	...	...	76 3 0	211 8 6	76 6 8	1,446 1

* Includes compensation for dearness of grain to Farm servants.

I have the honour to be,

Sir,

Your most obedient Servant.

R. S. JOSHI,

Superintendent, Government Experimental Farm, Nagpur.

LIST OF ANNEXURES.

A.—Statement showing the total areas under cultivation on the Experimental Farm, Nagpur, during 1900-1901.

B.—Statement showing the average rates of the cost of cultivation on the Experimental Farm, Nagpur, 1900-1901.

C.—Statement showing the rates used for valuing the produce of the Experimental Farm, Nagpur, during 1900-1901.

D.—Statement showing the comparison of receipts and expenditure of 1900-1901 with that of 1899-1900.

E.—Programme of experiments as it stood on the 1st June 1901.

Annexure A.

Total area under cultivation on the Experimental Farm, Nagpur, during the year 1900-1901.

Crop.	Area.	Total.	Grand Total.
	Acres.	Acres.	Acres.
A.—EXPERIMENTAL AREA.			
(1) *Kharif*—			
Cotton alone	1·81		
Cotton and tur	·57		
Cotton and juar	·27		
Juar	15·67		
Tur	·30		
Paddy	·48		
Maize	·25		
		19·35	
(2) *Rabi*—			
Wheat	11·97		
Wheat and gram (birra)	·21		
Gram	·30		
Linseed	·75		
Til	·70		
Mustard	·80		
Safflower	·65		
		15·38	34·73
B.—NON-EXPERIMENTAL AREA.			
(1) *Kharif*—			
Cotton	10·29		
Paddy	·39		
Tur	11·00		
Coriander	1·12		
Til	·32		
Popat	1·71		
Castor	1·49		
		26·32	
(2) *Rabi*—			
Wheat and gram (birra)	·96		
Gram	·40		
Linseed	·50		
Til	4·55		
Peas	·29		
Castor	·08		
Safflower	·16		
		6·94	33·26
GRAND TOTAL ...	...	...	67·99

Annexure B.

Statement showing the average cost per acre of each operation of cultivation on the Experimental Farm, Nagpur, during the year 1900-1901 *as deduced from the field cultivation book.*

[NOTE.—The hire of a pair of bullocks is taken as 12 annas; of a male cooly, 3 annas; of a female cooly, 1½ annas and of a child 1 anna.]

Class of operation.	Detail.	Rate per acre. Rs. a. p	Explanation.
Cost of tillage ...	Ploughing by Swedish plough ...	1 12 6	A pair of bullocks and a man for 1·90 days.
	Hoeing by bakhar (bullock hoe) ...	0 13 6	Do. do. for ·90 day.
	Weed hoeing by daura (small bullock weeding hoe).	1 0 2	A pair of bullocks and two men for ·89 day.
	Weed hoeing by dundia (large bullock weeding hoe).	0 8 6	Do. do. for ·47 day.
	Weeding by hand ...	2 7 7	10 women for 2·63 days.
Cost of sowing (including cost of seed).	Cotton by argarha (country drill hoe).	0 14 0	16 lbs. of seed (Re. 0-6-0). A pair of bullocks and a man and three women for ·41 day.
	Tur, by do. do. ...	1 0 9	17 lbs. of seed (Re. 0-12 11). A pair of bullocks and a man and three women for ·19 day.
	Juar by tifan (country drill) ...	1 2 8	14 lbs. of seed (Re. 0-11-6). A pair of bullocks and two men for ·39 day.
	Gram by nari-nagar (drill plough) ...	2 10 2	40 lbs. of seed (Rs. 1-3-11). A pair of bullocks and two men for ·68 day.
	Linseed by tifan (country drill) ...	1 7 0	13 lbs. of seed (Re. 1-0-3). Two pairs of bullocks and two men for ·20 day.
	Wheat by nari-nagar ...	7 5 6	100 lbs. of seed (Rs. 6-2-0). One pair of bullocks and two men for 1·08 days.
Cost of manure (excluding loading, carting and spreading.)	Saltpetre ...	16 1 6	240 lbs. (at Rs. 5-5-10 per maund).
	Bone-dust ...	3 6 0	360 lbs. cost of collecting (Re. 0 8-0 per maund) and of crushing (Re. 0-4-0 per maund).
	Cattle-dung ...	10 0 0	160 maunds (at Re. 0-1-0 per maund).
	Ashes of dung ...	11 0 8	160 maunds dung (at Re. 0-1-0 per maund) and drying and burning dung ashes (Re 1-0-8 per acre).
	Green-manuring with san-hemp (*Crotolaria juncea*).	8 2 0	100 lbs. of seed (Rs. 3-12-0); sowing broadcast (Re 0 4-2); covering seed by harrow (Re. 0-5-10); cutting and ploughing (Rs. 3-12-0).
	Green-manuring with kadoojira (*Vernonia cineria*).	6 0 8	Cutting and carting kodoojira (Rs. 2-6-0) and ploughing (Rs 3-10-8).
Cost of harvesting.	Picking cotton ...	1 3 8	2 women for 6·55 days each picking.
	Reaping juar ...	2 1 2	8 do. for 2·76 days.
	Do. gram ...	1 4 0	7 do. for 1·90 days.
	Do. linseed ...	1 0 8	5 do. for 2·22 days.
	Do. wheat ...	1 0 2	4 do. for 2·69 days.
Cost of threshing and cleaning.	Ginning cotton ...	6 8 0	2 men and 1 woman for 13·86 days; average produce per acre 1,114 lbs. of seed cotton.
	Threshing and cleaning juar ...	0 6 2	1 man and 1 woman for 1·37 days; average produce per acre 721 lbs. of grain and 2,211 lbs. of karbi.
	Do. do. gram ...	3 2 0	4 bullocks, 1 man, 2 women and 2 boys for 1·56 days; average produce per acre 509 lbs. of grain and 853 lbs. of chaff.
	Do. do. linseed ...	1 15 3	4 bullocks, 1 man, 2 women and 2 boys for ·97 days; average produce per acre 133 lbs. of seed and 372 lbs. of stalks.
	Do. do. wheat ...	2 12 2	4 bullocks, 1 man, 3 women and 2 boys for 1·31 days; average produce per acre 474 lbs of grain and 829 lbs. of straw.

Annexure C.

Statement showing the Rates used for valuing the produce of the Experimental Farm, Nagpur, during the year 1900-1901.

Name of produce.		Value.		Remarks.
		Rate.	Per	
		Rs. a. p.		
Cotton lint		76 0 0	Bojha of 345 lbs.	
Cotton seed		6 8 0	Khandi of 640 lbs.	
Juar	Grain ...	13 8 0	Khandi of 390 lbs.	
	Karbi ...	20 0 0	Poolas 1,000 ...	About 3,460 lbs.
Tur ...	Grain ...	19 0 0	Khandi of 421 lbs.	
	Stalks ...	0 12 0	8 bundles ...	About 560 lbs.
	Bhusa ...	1 8 0	One cart-load ...	About 478 lbs.
Gram ...	Grain ...	17 0 0	Khandi of 390 lbs.	
	Chaff ...	1 8 0	One cart-load ...	About 478 lbs.
Linseed (chaval-katha) ...	Seed ...	23 0 0	Khandi of 385 lbs.	
	Stalks and bhusa.	1 8 0	One cart load ...	About 478 lbs.
Wheat (*haura*—Nagpur) ...	Grain ...	21 0 0	Khandi of 400 lbs.	
	Straw ...	1 12 0	One cart-load ...	About 478 lbs.

Annexure D.

Statement showing the comparison of Receipts and Expenditure of the Experimental Farm, Nagpur, of 1900-1901 *with that of* 1899-1900.

Receipts.	1899-1900.	1900-1901.	Remarks.
	Rs. a. p.	Rs. a. p.	
Commercial sale of produce ...	766 4 1	787 3 3	
Distribution ... { Seeds ...	43 2 3	52 12 3	
Distribution ... { Implements ...	122 10 0	23 4 0	
Rent of Government land ...	427 5 11	722 12 3	
Sewage Farm	755 12 9	541 5 3	
Miscellaneous	877 12 2	645 15 9	
Grand Total ...	2,992 15 2	2,773 4 9	

Expenditure.	1899-1900.	1900-1901.	Remarks.
	Rs. a. p.	Rs. a. p.	
Purchase of seeds and plants ...	15 9 3	96 9 9	Purchase of wheat and gram for seed.
Repairs of premises... ...	341 8 5	877 15 6	Construction of cattle-shed and Overseer's quarters at Telinkheri.
Postage	10 1 0	5 6 0	
Service telegrams	.....	.....	
Country stationery	0 3 6	0 6 9	
Purchase of books	4 14 0	.....	
Do. of cattle	219 0 0	.....	
Do. of implements ...	170 3 0	139 9 9	
Repairs of tools and plant ...	27 6 3	25 14 6	
Feed and care of cattle ...	490 5 9	426 10 0	
Irrigation	.....	.....	
Manure	47 4 0	11 10 6	
Variable labours, agricultural ...	108 3 0	67 15 0	
Do. earthwork, &c. ...	.....	.....	
Packing and freight ...	30 5 0	90 8 7	
Sewage Farm	862 4 0	884 2 6	
Binding charges	3 4 0	1 8 0	
Other miscellaneous charges ...	73 8 2	102 0 10	
Total ...	2,403 15 4	2,730 5 8	
Establishment	4,364 6 8	4,508 10 10	Includes compensation for dearness of grain.
Total ...	4,364 6 8	4,508 10 10	
Travelling allowance ...	80 10 0	172 3 0	
Total ...	80 10 0	172 3 0	
Grand Total ...	6,849 0 0	7,411 3 6	

Annexure E.

EXPERIMENTAL FARM, NAGPUR.

Programme of Experiments as in force on the 1st June 1901.

Number of Field.	Purpose of Experiment.	Crop. 1st year.	Crop. 2nd year.	Crop. 3rd year.	Special treatment. 1st year.	Special treatment. 2nd year.	Special treatment. 3rd year.	Year (commencing June) in which experiment started.	Remarks.
				Manure Experiments.					
A—1	Effect on wheat grown continuously of different kinds of manures applied year after year with irrigation.	Wheat ...	Wheat ...	Wheat ...	Saltpetre ...	Same as in first year.	Same as in first year.	1883 ...	Cropping and treatment similar every year. Quantities per acre:— Saltpetre, 240 lbs. Bone-dust, 360 lbs. Cattle-dung, 160 mds. Ashes of 160 mds. dung.
—2		Do. ...	Do. ...	Do. ...	Bone-dust ...				
—3		Do. ...	Do. ...	Do. ...	Saltpetre and bone-dust ...				
—4		Do. ...	Do. ...	Do. ...	Cattle-dung ...				
—5		Do. ...	Do. ...	Do. ...	Dung and bone-dust ...				
—6		Do. ...	Do. ...	Do. ...	Ashes of dung ...				
—7		Do. ...	Do. ...	Do. ...	*Nil.* ...				
—8		Do. ...	Do. ...	Do. ...	San-hemp ploughed in green.				
B—1	Do. without irrigation.	Wheat ...	Wheat ...	Wheat ...	Saltpetre ...	Do. ...	Do. ...	1890 ...	Ditto.
—2		Do. ...	Do. ...	Do. ...	Bone-dust ...				
—3		Do. ...	Do. ...	Do. ...	Saltpetre and bone-dust ...				
—4		Do. ...	Do. ...	Do. ...	Cattle-dung ...				
—5		Do. ...	Do. ...	Do. ...	Dung and bone-dust ...				
—6		Do. ...	Do. ...	Do. ...	Ashes of dung ...				
—7		Do. ...	Do. ...	Do. ...	*Nil.* ...				
—8		Do. ...	Do. ...	Do. ...	San-hemp ploughed in green.				
Ville—1	Practical method of soil analysis by using chemical manures as devised by Mr. George Ville.	Wheat ...	Wheat ...	Wheat ...	Amm. chlor, cal. superphos, pot. sulph. and cal. sulph.	Do. ...	Do. ...	1899 ...	Cropping and treatment similar every year. Quantities per acre:— Amm. chlor, 140 lbs. Cal. suprphos. 180 lbs. Pot. sulph. 90 lbs. Cal. sulph. 100 lbs.
—2		Do. ...	Do. ...	Do. ...	As in 1 less cal. superphos.				
—3		Do. ...	Do. ...	Do. ...	As in 1 less amm. chlor. ...				
—4		Do. ...	Do. ...	Do. ...	No manure ...				
—5		Do. ...	Do. ...	Do. ...	As in 1 less pot. sulp. ...				
—6		Do. ...	Do. ...	Do. ...	As in 1 less cal. sulph. ...				

18—1	Relative effect of green-manuring box-dung and stall-dung.	Wheat ...	Wheat ...	Wheat ...	San-hemp ploughed in green.	Do. ...	Do. ...	1890 ...	Cropping and treatment similar every year.
—2		Do. ...	Do. ...	Do. ...	*Nil.* ...				
—3		Do. ...	Do. ...	Do. ...	Box-dung ...				
—4		Do. ...	Do. ..	Do. ...	Stall-dung ...				
32—1	Effect on wheat of green-manuring with san-hemp (*crotolaria juncea*).	Wheat ...	Wheat ...	Wheat ..	San-hemp ploughed in in green.	Do. ...	Do. ...	1891 ...	Ditto.
—2		Do. ...	Do. ...	Do. ...	*Nil.* ...				
23—1	Effect on wheat of manuring with saltpetre in different rates per acre without irrigation.	Wheat ...	Wheat ...	Wheat ...	*Nil.* ...	Do. ...	Do. ...	1896 ...	Ditto.
—2		Do. ...	Do. ...	Do. ...	Saltpetre, 240 lbs. per acre.				
—3		Do. ...	Do. ...	Do. ...	Do. 80 do. do.				
68—1	Do. with irrigation.	Wheat ...	Wheat ...	Wheat ...	*Nil.* ...	Do. ...	Do. ...	1896 ...	Ditto.
—2		Do. ...	Do. ...	Do. ...	Saltpetre, 240 lbs. per acre.				
—3		Do. ...	Do. ...	Do. ...	Do., 80 do. do.				
15—1	To test the effect of manuring at diffenent times of the year.	Wheat ...	Wheat ...	Wheat ...	Manured with dung on June 1st.	Do. ...	Do. ...	1896 ...	Ditto.
—2		Do. ...	Do. ...	Do. ...	Do. in July end ...				
55—1	Do. do. ...	Wheat ...	Wheat ...	Wheat ...	Manured with dung on June 1st.	Do. ...	Do. ...	1896 ...	Ditto.
—2		Do. ...	Do. ...	Do. ...	Do. in July end ...				
9—1	To test the effect of phosphatic manures on different oil-seeds suggested by Dr. Leather.	Linseed and mustard.	Til and safflower.	Linseed and mustard.	*Nil.* ...	Do. ...	Do. ...	1896 ...	Treatment similar every year and crop to be in rotation.
—2		Do. ...	Do. ...	Do. ...	Saltpetre ...				
—3		Do. ...	Do. ...	Do. ...	Burnt bones ...				
—4		Do. ...	Do. ...	Do. ...	Raw bones ...				
—5		Do. ...	Do. ...	Do.	Raw bones and saltpetre...				
59—1	Do. do. ...	Til and safflower ...	Linseed and mustard.	Til and safflower.	*Nil.* ...	Do. ...	Do. ...	1896 ...	Ditto.
—2		Do. ...	Do. ...	Do. ...	Saltpetre ...				
—3		Do. ...	Do. ..	Do. ...	Burnt bones ...				
—4		Do. ...	Do. ...	Do. ...	Raw bones ...				
—5		Do. ...	Do. ...	Do. ...	Raw bones and saltpetre...				
	Rotation Experiments without Manures.								
29—1	Effect of rotations with wheat.	Wheat ...	Wheat ...	Wheat ...	*Nil.* ...	*Nil.* ...	*Nil.* ..	1890 ...	Two year rotation, *i. e.*, the fourth year will follow the second.
—2		Do. ...	Fallow ...	Do. ...					
—3		Do. ...	Gram ...	Do. ...					
—4		Do. ...	Juar and tur ...	Do. ...					
—5		Do. ...	Kodon ...	Do. ..					

Annexure E.—(*Concld.*)

Number of Field.	Purpose of Experiment.	Crop.			Special treatment.			Year (commencing June) in which experiment started.	Remarks.
		1st year.	2nd year.	3rd year.	1st year.	2nd year.	3rd year.		
		Rotation Experiments without Manures.—(*Concld.*)							
61—1	Effect of rotations with cotton.	Cotton and tur ...	Cotton and tur...	Cotton and tur...	*Nil.*	*Nil.*	*Nil.*	1893 ...	Two-year rotation, *i. e.*, the fourth year will follow the second.
—2		Do. ...	Wheat ...	Do. ...					
—3		Do. ...	Gram ...	Do. ...					
		Rotation Emperiments with Manures.							
63—1	Effect of green-manuring with san-hemp on wheat with fallow interposed, on wheat in rotation with cotton.	Fallow ...	Wheat ...	Fallow ...	Green-manuring with san-hemp.	*Nil.*	Same as in 1st year.	1899 ...	Cropping and treatment similar every year.
—2		Do. ...	Do. ...	Do. ...	*Nil.*				
—3		Wheat ...	Cotton ...	Wheat ...	Green-manuring with san-hemp.				
—4		Do. ...	Do. ...	Do. ...	*Nil.*				
17—1	Effect on wheat and cotton in rotation of green manuring with kadoo-jira (*Vernonia cineria*).	Wheat ...	Cotton ...	Wheat ...	Green-manuring with weeds cut from waste land.	*Nil.* ...	Do. ..	1890 ..	Treatment similar every year and crop to be in rotation.
—2		Do. ...	Do. ...	Do. ...					
44—1	Relative effect on cotton and wheat in rotation of box-dung, stall-dung and bone-dust.	Cotton ...	Wheat ...	Cotton ...	Stall-dung ...	Same as in first year.	Do. ...	1890 ...	Ditto.
—2		Do. ...	Do. ...	Do. ...	Box-dung ...				
—3		Do. ...	Do. ...	Do. ...	*Nil.*				
—4		Do. ...	Do. ...	Do. ...	Bone-dust ...				
57—1	Effect of rotations with linseed.	Linseed ...	Linseed ...	Linseed ...	*Nil.*	*Nil.* ...	Do ...	1890 ...	Crop to be in rotation.
—2		Do. ...	Gram ...	Do. ..	Green-manuring with coriander in year of linseed.				
—3		Do. ...	Cotton ...	Do. ...	*Nil.* ...				
—4		Do. ...	Tur ...	Do. ...	Green-manuring with coriander in year of linseed.				

42-N—N 42-N—S	To test the effect of potassic and phosphatic manures on tur and wheat grown in rotation.	Tur ... Do. ...	Wheat ... Do. ...	Tur ... Do. ...	Powdered bones and potassic sulphate. *Nil.*	Do. ...	Do. ...	1896 ...	Ditto.
Experiments with Mixtures of Crops.									
55—3 —4 —5	Effect of mixing crops, the principal one being cotton.	Cotton ... Cotton and tur in proportion of 6 lines to 2. Cotton and juar in proportion of 6 lines to 2.	Same as in first year.	Same as in first year.	*Nil.* ...	*Nil* ...	*Nil* ...	1895 ...	Cropping similar every year. Manure to be applied occasionally.
25—1 —2	Effect of mixing crops, wheat and a leguminous crop, gram.	Wheat ... Wheat and gram ...	Wheat ... Wheat and gram.	Wheat ... Wheat and gram.	Do. ...	o. ...	Do. ...	1890 ...	Ditto.
Experiments with Tillage.									
21—1 —2 —3	Effect of tillage to various depths.	Wheat ... Do. ... Do. ...	Wheat ... Do. ... Do. ...	Wheat ... Do. ... Do. ...	To be ploughed every year. To be hoed (bakhared) every year. To be ploughed and bakhared in alternate years.	Same as in first year.	Same as in first year.	1890 ...	Cropping and treatment similar every year.
22—1 —2 —3	Do. do. ...	Wheat ... Do. ... Do. ...	Wheat ... Do. ... Do. ...	Wheat ... Do. ... Do. ...	To be ploughed every year. To be hoed (bakhared) every year. To be ploughed and bakhared in alternate years.	Do. ...	Do. ...	1897 ...	Ditto.
33—1 —2 —3	Do. do. ...	Wheat ... Do. ... Do. ...	Wheat ... Do. ... Do. ...	Wheat ... Do. ... Do. ...	To be bakhared ... To be ploughed with native plough. To be ploughed with Swedish plough.	Do. ...	Do. ...	1899 ...	Ditto.
Experiments with selection of Seed.									
40—1 —2	Effect of selection of seed.	Wheat ... Do. ...	Wheat ... Do. ...	Wheat ... Do. ...	Selected seed .. Unselected seed ...	Do. ...	Do. ...	1899 ...	Ditto.
Variety of Crops.									
41 & 43	To test the rust-proof property of different kinds of wheat.	Wheat ...	Wheat ...	Wheat ...	Kachera manure ...	Do. ...	Do. ...	1896 ...	Ditto.
39	To test the Australian varieties of wheat to suit the Indian soil.	Do. ...	Do. ...	Do. ...	Do. ...	Do. ...	Do. ...	1897 ..	Ditto.

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